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Improved Carbine.

The breech-loading carbine is now extensively used by our cavalry, and has proved to be one of the most formidable arms in the service. We have given our views upon the value of breech-loaders so often, that we shall not here repeat them. The breech-loader illustrated herewith is one of the most simple in construction that we have seen, thus rendering it especially desirable for army service. The principal peculiarity is that the lock is so made as to be all in one solid compact block of iron, as shown in Fig. 2, where one side of the plate is thrown open to disclose the interior; the lock extends from *a* to *a*. This lock-block, as we may call it, fits in a recess behind the barrel, and is raised and lowered up to, or from, the open breech by pulling the guard, A. When this is done certain cam-grooves in the side of the lock plate are operated on by mechanism, so that the breech-block is lowered directly away from the breech, thus leaving the way clear to insert the new cartridge. The return of the guard raises the breech-block and closes the breech opening gas-tight. The action of opening the breech also removes the cartridge shell, so that only one motion is required to perform all the operations. The lock may be taken out in a moment by pulling the guard, A, down to the pin, B; this is a valuable feature, for if the barrel is bent, or the stock smashed in battle, it is a simple matter to take off the lock, and preserve it so that it can be applied to other weapons, or at least disable it so that the enemy cannot use it. If the lock becomes deranged in any way, it is easily examined and adjusted by slipping it out of the breech; by turning the screw, C, partly around, the side plate can be turned back, as shown in Fig. 2. The ammunition to be used is of the metallic cartridge kind, and if this is exhausted, it can still be used as a muzzle-loader. This weapon is, in some instances, fitted with a sliding nipple, so arranged that it is acted on by the hammer, and the extreme end of the nipple inside forced into the fulminate in the copper cartridge; but should the fixed ammunition be expended, the empty shell is left in the barrel and the loose powder poured in; the loose nipple is then capped with a common percussion cap, and fire communicated through it to the loose shell. This feature renders the weapon valuable to sportsmen. This breech-loader was patented through the Scientific American Patent Agency on Jan. 12th, 1864, by W. X. Stevens, of Worcester, Mass.; for further information address the inventor at Cold Springs, N. Y.

STEVENS'S BREECH-LOADING CARBINE.

Captain Palliser, of the Eighteenth Hussars, England, has produced strong and exceedingly cheap shot by a simple process. Instead of casting the shot in sand and allowing the surface to cool gradually, the metal is poured into a cold iron mold, so as to cool the surface with the utmost possible rapidity long before the interior has hardened. In this way a ball is turned out which, to judge from recent trials, combines almost the hardness of steel with the destructive effects of a segment shell. Hitherto cast-iron shot have smashed against the plates, but this penetrates and breaks into numerous pieces after passing through the obstacle.

[This makes a chilled shot; the surface is as hard as glass so that ordinary steel tools will not cut it. Chilled tools made in the same way are often used in turning chilled iron.—Eds.

GARDNER'S POCKET-KNIFE.

This convenient little instrument is intended for soldiers' use, or for sportsmen and camp life in general. It answers all the purposes of a stout jack-knife, and has additional advantages in the other appendages. For taking a rifle or musket apart it is indispensable, and it comprises all the tools requisite for the operation. In the end of the handle is the cone-wrench, and immediately above it, jointed so as to

turn down in the handle, is the picker to clear the nipple if it becomes clogged. The strong blade for cutting is made of the best steel, well tempered, so also is the screw-driver, just below it. All of these attachments shut up within the handle just as ordinary knife-blades do, and the instrument, as thus arranged, is an exceedingly useful one. It was patented through the Scientific American Patent Agency on July 5th, 1864, by G. H. Gardner, of Philadelphia, Pa.; for further information address the inventor at 701 Chesnut street, Philadelphia.

Why do they call them strawberries? is the question most people have asked about the ruddy fruit. The name is derived from a custom long ago prevalent in England, of the children stringing the berries on straws of grass and selling so many strings for a penny.—*Bangor Courier.*

[Raspberries are so called because they were once strung on rasps.—Eds.

Fishing by the Electric Light.

A first attempt was made to fish by electric light a short time since at Dunkirk. The light was supplied by a pile on Bunsen's principle, composed of about fifty elements, and it succeeds tolerably well, but the employment of the pile was attended with much inconvenience. It was then determined to repeat the attempt with a magneto-electric machine. The new experiments tried at Dunkirk and Ostend had a double object—1. To prove how the light produced by the machine would act under water. 2. To discover the effect the light would produce on the fish. The first object was completely accomplished, and it is now demonstrated that magneto-electric machines and the light they produce are applicable to all submarine works. In fact, this light was constant at 180 feet under water, and it extended over a large surface. The machine, nevertheless, was placed at a distance of more than 300 feet from the regulator of the electric light. The glass sides of the lantern remained perfectly transparent, and the quantity of coal consumed to drive the magneto-electric machine was less than if the light had been in the open air.

Heroism of an Engineer.

The Elmira (N. Y.) *Gazette* records the following act of sublime devotion to duty and of heroic self-abnegation:

"The engineer on the train conveying prisoners to this place, when the collision was discovered to be unavoidable, with certain death staring him in the face, heroically remained at his post and reversed the engine, and was buried in the wreck. When found, his back was against the boiler, and he was literally burnt to death. He told those who came to his assistance to keep away from him for their own safety, as he feared the boiler would burst. Every exertion was made to extricate him, but without avail until life was extinct. His name was William Ingram."

Best Way to work Hand-pumps.—The mode of application of human labor to the working of pumps seems to have a much greater effect on the useful work obtained than is generally believed. The experiments of M. Chaves place out of doubt the mechanical advantage afforded by a continuous movement of rotation produced by cranks, over the use of beams working with an alternate motion. The useful effect developed by a small pump worked by a crank and fly-wheel was very nearly double that acquired by a similar pump worked by a beam.

There was but 60 pounds difference in favor of the *Kearsarge*, in the weight of metal thrown at a broadside during her combat with the *Alabama*. The new 20-inch gun weighs 58 tuns.

FAIRBAIRN ON STEAM BOILERS.

Hitherto we have confined our attention to boilers constructed of plate iron, under the assumed impression that rolled plate iron is the only material calculated to make a good boiler. At the present moment this is apparently the case, but the time is not far distant when we may save one-third of the weight without incurring any diminution of strength. If we look around us, there are evidences in every direction of changes and improvements tending to a revolution in the chemical as well as the mechanical properties of iron. We know to a fraction the exact quantity of carbon, or any other element of chemical compound, that must be left in or taken out in the manipulating process of making iron or steel; and we can measure to a nicety the per centage of carbon that is necessary to produce what is called homogeneous iron, or that description of metal that partakes in a greater or less degree of the characteristics of both iron and steel. These combinations are highly valuable, as they can be modified to any extent, and give to the operator in the manufacture of iron all the requirements and gradations of a ductile, fibrous, or crystalline structure. Now, although all these combinations and varied powers of production are in operation at the present time, they have not yet arrived at that degree of certainty as to produce either iron or steel of the exact quality that is required. There still exists a want of uniformity of structure, and until this is accomplished we must be content to take for the purposes of calculation the minimum instead of the maximum of its power of resistance to strain. I do not, however, despair, as the number of distinguished men who are now employed in that direction is a sufficient guarantee for ultimate success.

United to chemical combinations and analysis in the manufacture of iron is a due observance of the varied forms and conditions of the processes in the mechanical manipulation to which the blooms or ingots are subjected. These, when carefully conducted, having regard to temperature, will produce the requisite elongation of fibers, and that amount of ductility or hardness which may be required as a property of a given description of iron or steel, and that probably without injury to that homogeneous character so much wanted in constructive art. It is quite evident that the old process of piling and welding a number of bars together to make a plate, or any other particular form, is not a sound process of manufacture, as the welding is often imperfect, and hence follows that laminated appearance of the fibrous and crystalline character invariably present in plates and large masses made from piled bars. This is not, however, the case when the article is made from the homogeneous ingot, which, having been cast, is then subjected to consolidation by the hammer and the rolls; and thus, by repeated heating, its crystalline character is partially reduced to the fibrous state by impact, elongation, and compression. From this device its resistance to strain is augmented and greatly improved. With this prospect before us we may, therefore, look forward with hope to a more perfect state of manufacture, and the realization of that desideratum which is still wanting, viz., perfect uniformity in the strength and other properties of both iron and steel. It is true we have had boilers made and ships built from steel plates, but we are still wanting in that degree of uniformity of character as would indicate with certainty that the whole batch was equally strong, as a single faulty plate might prove equally fatal as if the whole were of that stamp.

Effects of the Union Shells fired into Charleston.

A writer in the *Cornhill Magazine* (London) grapically describes his experience of a night in a Charleston hotel during a bombardment by the Union forces. He says:—

"On the 21st August, at half-past one A. M., I was lying on my bed in the Charleston Hotel, unable to sleep from the excessive heat, and listening to the monotonous sound of the cannonade kept up on the enemy's position from the batteries on James Island. Restless and weary of the night, I had lighted a candle in defiance of the musquitoes, and sought to pass away the time with a volume of *Les Miserables*. It happened to be the one containing the account of the battles of Waterloo; and while deeply interested in the description of the rushing squadrons of cuirassiers, I was startled by a noise that, from connection with my reading, resembled the whir of a phantom brigade of cavalry galloping in mid-air. My first feeling was that of utter astonishment; but a crash, succeeded by a deafening explosion in the very street on which my apartment was situated, brought me with a bound into the center of the room. Looking from the window, I saw smoke and fire issuing from a house in which were stored the drugs of the medical purveyor. A watchman was running frantically down the street, and when he reached the corner just below me, commenced striking with his staff against the curb; a signal of alarm practiced among the Charleston police. At first I thought a meteor had fallen; but another awful rush and whir right over the hotel, and another explosion beyond, settled my doubts I might have had—the city was being shelled. People are not given to laughing under such circumstances, but I will defy any one who witnessed what I witnessed on leaving my room, not to have given way to mirth in moderation. The hotel was crowded with speculators, who had been attracted to the city by the sale of some blockade cargoes, and the corridors were filled with these terrified gentlemen, rushing about in the scantiest of costumes and the wildest alarm. One perspiring individual, of portly dimensions, was trotting to and fro with one boot on and the other in his hand, and this was nearly all the dress he had to boast of. In his excitement and terror he had forgotten the number of his room, from which he had hastened at the first alarm, and his distress was ludicrous to behold. Another, in semi-state of nudity, with a portion of his garments on his arm, barked the shins of every one in his way in his efforts to drag an enormous trunk to the staircase. On reaching the hall I found a motley crowd, some of whom with biggest of words were cursing the Federal commanders. Whir! came another shell over the roof, and down on their faces went every man of them, into tobacco-juice and cigar-ends, and clattering among the spittoons. I need not say that this is a class of men from whom the Confederacy hopes nothing; on the contrary, by their extortion, practiced on a suffering people, they have made themselves execrated. If a shell could have fallen in their midst and exterminated the whole race of hucksters, it would have been of great benefit to the South. The population was now aroused, the streets filled with women and children, making for the upper part of the city, where they would find comparative safety. The volunteer fire-brigades brought out their engines, and parties of the citizen reserves were organized rapidly and quietly, to be in readiness to give assistance where required. The first engine that reached the house struck by the first shell, was one belonging to a negro company, and at it they went with a will, subduing the fire in a marvellous short time. At every successive whir above them, the negroes shouted quaint invectives against the 'cussed bobolitionists,' scattering for shelter until the danger was passed. Through the streets I went, and down to the Battery Promenade, meeting on my way sick and bedridden people carried from their homes on mattresses, and mothers with their infants in their arms running they knew not whither. Reaching the Promenade, I cast my eyes toward the Federal position, and presently, beyond James Island, across the marsh that separates it from Morris Island, came a flash, then a dull report, and, after an interval of some seconds, a frightful rushing sound above me told the path the shell had taken; its flight must have been five miles."

Cheap Bread.

"Bread and butter" are the only articles of food of which we never tire for a day, from early childhood to extreme old age. A pound of fine flour or indian (corn) meal contains three times as much meat as one pound of butcher's roast beef; and if the whole product of the grain, bean and all, were made into bread, fifteen per cent more of nutriment would be added. Unfortunately the bran, the coarsest part, is thrown away, the very part which gives soundness to the teeth and strength to the bones and vigor to the brain. Five hundred pounds of fine flour give to the body thirty pounds of the bony elements; while the same quantity of bran gives one hundred and twenty-five pounds. This bone is "lime," the phospate lime, the indispensable element of health to the whole human body, from the want of the natural supply of which multitudes of persons go into a general "decline." But swallowing "phosphate" in the shape of powders or in sirups, to cure these "declines," has little or no virtue. The articles contained in these "phosphates" must pass through nature's laboratory, must be subject to her manipulations, in alembics especially prepared by Almighty power and skill, in order to impart their peculiar virtue to the human frame; in plainer phrase, the shortest, safest, and most infallible method of giving strength to body, bone and brain, thereby arresting disease and building up the constitution, is to eat and digest more bread made out of the whole grain, whether of wheat, corn, rye or oats.

But we must get an appetite for eating more, and a power of digesting more. Not by the artificial and lazy method of drinking bitters and taking tonics, but by moderate, continued, and remunerative muscular exercise in the open air every day, rain or shine. And that we may eat the more of it, the bread must be good and cheap, and healthful; and that which combines these three qualities to a greater extent than any other known on the face of the globe, as far as we know, is made thus:—To two quarts of corn (indian) meal and one pint of bread sponge, with water sufficiently to wet the whole, add one-half pint of flour and a teaspoonful of salt. Let it rise, then knead well, unsparingly, for the second time. Place the dough in the oven, and let it bake an hour and a half. Keep on trying until you succeed in making a light, well-baked loaf. Our cook succeeded admirably by our directions at the very first trial. It costs just half as much as bread from the finest family flour, is lighter on the stomach, and imparts more health, vigor and strength to the body, brain and bone. Three pounds of such bread (at five cents a pound for the meal) affords as much nutriment as nine pounds of good roast beef (cost, at twenty-five cents, $2 25), according to standard physiological facts — *Hall's Journal of Health.*

A Petrified Bee-tree.

The Grass Valley *National*, of California, says:—"There was found a few days since, in the diggings of John Chew & Co., on Buckeye Hill, in this county, between Greenhorn creek and Chalk Bluff mountain, a bee-tree, with a large bee-hive, honey and bees, all petrified. The remaining portion of the tree in which the bee-hive was found is 2½ feet in diameter and about 40 feet long. Chew & Co. found the petrified bee-hive 75 feet beneath the surface, while piping their claims. The bee-hive is no matter of fancy, but of pure demonstration. Before us is a sample of the comb full of honey, all petrified. The normal thickness of the comb, the duplicate of cells with their invariable hexagonal shape, are all before us as distinctly as if a fresh piece of honey-comb, all dripping and just cut from the box, had been brought and placed before our eyes on a sheet of paper."

General Butler an Inventor.

A novel mode of giving light to benighted rebels on the subject of the President's "Amnesty" has recently been tried with success along our lines. A common boy's kite is sent skyward and rebelward whenever the wind is favorable, having two strings, one strong and the other weak. To a particular weak spot in the weak string a bundle of the printed promises of amnesty is fastened. When the kite is high enough and soaring far within rebel lines, the stout string is slackened and all the strain is brought upon the weak. Instantly the cord parts at the tender spot, and the proclamations, "thick as autumnal leaves which strew the streams in Valambrosa," shower gently o'er hill and plain and forest top, where the rebels can pick them up. Is not that a brilliant thing, and worthy of universal Yankee ingenuity?

[This is said to be an invention of General Butler's.

STEVENSON'S TURBINE.—Some time since Mr. Stevenson expressed the opinion in our office that turbines were not adapted to work in which the amount of resistance was subject to great variation, but has since changed his mind and now informs us that his wheels can be regulated very perfectly when machinery is thrown into and out of gear.

On Screw Propellers.

An interesting discussion upon this important subject was recently carried on in the London Association of Foremen Engineers. We transcribe a portion from the *Artizan*:—

"The screw should be in all cases accurately proportioned to the size of the ship, its diameter being as large as the draught of water would admit, and the number of blades suited to the diameter. In the earlier experiments with the *Archimides* and the *Rattler*, screws were tried with two, four, and six blades, but he did not think that the length of the screws had been regulated in proper proportions, or those experiments would have demonstrated what had subsequently been proved, namely, that an increased number of narrow blades was superior to a smaller number of broad ones. The thrust to be obtained by a wide blade was not to be measured by its surface, for the water when it had been acted upon had motion imparted to it, and was no longer effective for thrust. It might, indeed, become a drag, as was exemplified in Smith's first screw of two and a half turns. When one-half of the blade in this case was broken by accident, the vessel doubled her speed immediately.

"The vibration imparted to the ship by the action of the screw was one great objection to its employment. Much has been done to obviate this evil by curving the leading edge of the blades, and by other means. Griffiths undoubtedly stood prominent with improvements in this direction. He had curved both leading and following edges of screw blades, and made them widest in the middle, after the manner to some extent of the paddle of a South Sea Indian. This mode of dealing with screw blades had, however, been previously worked out by the late Mr. Maudslay, in a series of experiments on board his own yachts of 105 tuns, the *Water Lily*, the *Firefly*, and the *Sunbeam*, which were expressly built for the purpose. In these he also demonstrated the advantages of his own feathering screw, which for efficiency and symmetry of form he (Mr. Walker) believed to be as yet unrivaled. This allowed of the screw-hole being closed when the vessel was under canvas only, and thus materially improved her sailing and steering qualities.

"The two-bladed screw had been until lately almost exclusively employed by the Admiralty, and it certainly possessed the advantages of portability. It could be lifted out of the water when the ship was under sail, and lowered into it again when required by an operation managed on deck. The blades were necessarily made of considerable width, in order to give surface. Latterly, however, the lifting-out operation had been sacrificed in order to obtain the greater benefit of more and narrower blades. Instead, therefore, of giving one-sixth or seventh of the pitch or convolution, and two blades, the growing practice is to employ screws of four blades with one-twelfth or one-fourteenth of the pitch. The consequences of this was that less slip and greater efficiency was obtained. The engines were disconnected when the vessel was under canvas, and the screw thus allowed to rise loosely in its bearings.

"Mr. Walker said he gave the preference to a form of screw not much in use in this country, and which consisted of narrow blades of scymetar-like shape. By this arrangement, vibration—resulting mainly from the sudden shock of the upper and lower blade striking the water in close proximity to the stern post—would be largely obviated. It also caused the more effective part of the blade to be thrown back, as it were, out of the eddy of the ship, and this had long been his favorite idea in regard to the screw propeller; and lately he had had an opportunity of seeing it, in one instance, most successfully realized. An old straight-bladed screw had been displaced in order to make room for one with curved blades, and the speed of the vessel in which the experiment was tried had been materially increased by the change.

"Double or twin screws were also engaging the attention of scientific and practical men; they were right and left-handed, and were placed one under each quarter. He had no faith in the supposition that they would supersede the single screw except under very peculiar circumstances, and they did not effect the anticipated benefit of turning a ship quickly, and in her own length. The leverage between the two screws was not sufficiently great to act upon the length of the vessel, and this counteracted each other's influence, and brought the ship to a dead stand. More complicated machinery, too, was involved in their application, and, after all, it was only in ships of very light draught and heavy burden, moving in shallow waters, that they could be advantangeously used. Perhaps, these conditions were presented in some of our steam rams and floating batteries, where the width of beam and weight were large and heavy."

Is Vaccination a Perfect Protection from Small-pox?

This point is thus discussed in the able article on vaccination, in Appleton's new *Cyclopedia*:—

"When vaccination was first introduced, it was hoped and believed by its advocates that it would afford complete and permanent protection from the attacks of small pox. This hope has proved fallacious. It was discovered that those who had been well and thoroughly vaccinated were still liable, to some extent, to attacks of small pox; and though in general the disease was modified (varioloid) and rendered shorter in duration and milder in degree, still it occasionally resulted in death. The degree of protection afforded by vaccination becomes thus a question of great interest. Its extreme value was easily estimated by statistical researches. In England, in the last half of the 18th century, out of every 1,000 deaths, 96 occurred from small pox; in the first half of the present century, out of every 1,000 deaths, but 35 were caused by the same disease. The amount of mortality in a country by small pox would seem to bear a fixed relation to the extent to which vaccination is carried out. In all England and Wales, for some years previous to 1853, the proportional mortality by small pox was 21·9 to 1,000 deaths from all causes; in London it was but 16 to 1,000; in Ireland, where vaccination is much less general, it was 49 to 1,000, while in Connaught it was 60 to 1,000. On the other hand, in a number of European states where vaccination is more or less compulsory, the proportionate number of deaths from small pox varies from 2 per 1,000 of all causes in Bohemia, Lombardy, Venice, and Sweden, to 8·33 per 1,000 in Saxony. Although in many instances persons who had been vaccinated were attacked with small pox in a more or less modified form, it was noticed that the persons so attacked had been commonly vaccinated many years previously. It would seem that the mere lapse of time in many cases is sufficient to destroy the protective influence of vaccination. The question very naturally arises:—For how long a period does the protective influence last? To this it is impossible to give a definite answer; it varies with different individuals. The same thing happens with regard to the protective influence of an attack of small pox itself; in most persons it lasts for life; many, after a period more or less prolonged, are liable to a second attack; while cases have occurred in which a third attack has proved fatal. The period of puberty is generally thought to produce such changes in the system as to destroy the protective influence of vaccination. In all cases revaccination would seem to be a test of the loss or presence of the protective influence; to render this test certain, where revaccination does not succeed on the first trial, it should be a second time carefully performed. In the Prussian army in 1848, 28,859 individuals were revaccinated; among whom, however, in 6,373 the cicatrices of the preceding vaccination were indistinct or invisible. Of these, 16,862 had regular vesicles, 4,404 irregular vesicles, and in 7,753 cases no effect was produced. On a repetition of the vaccination in these last, it succeeded in 1,579 cases. Among the whole number successfully revaccinated either in 1848 or in previous years, there occurred but a single case of varioloid, and not one case of small pox; while 7 cases of varioloid occurred either among the recruits or among those revaccinated without success."

LARGE BALLOON.—An English journal says:—"The inflation of Coxwell's new balloon in the centre transept of the crystal palace recently was witnessed with great interest by a large concourse of people the large aerial machine will carry 25 persons in addition to the usual requirements of grappling irons, ropes, &c., which are necessarily both large and strong."

Curious Ancient Almanac.

Galignani has an account of a recent discovery at Pompeii. It is as follows:—

"A Roman almanac has just been found in an excavation near the Gate of Isis, at Pompeii. It is a square block of white marble; on each side of which are inscriptions relative to three months of the year, arranged in perpendicular columns. At the head of each is represented the sign of the zodiac to which the month responds. The almanac contains some curious information on the agriculture and religion of the Romans. At the top of each column, and under the sign of the zodiac is the name of the month and the number days; next comes the nones, which, during eight months of the year, fall on the fifth day, and are consequently called *quintanae;* for the remainder of the year they commence on the seventh day, and are called *septimanae.* The ides are not indicated, because there is always seven days between them and the nones.

"The number of hours of the day and night is also marked, the whole number being represented by the ordinary Roman figure, the fractions by *s* for semi, and by small horizontal lines for the quarters. Lastly, the sign of the zodiac in which the sun appears is also named; the days of the equinoxes and of the summer solstice are also given. For the winter solstice there are the words *hemis tritium* (beginning of the winter). Next comes the chapter of agriculture, in which farmers are reminded of the principal operations that ought to be carried on during the month. The almanac terminates by the religious part; it points out the god who presides over each month; gives a list of the religious *fetes* which fall during the lapse of time, and warns the farmer not to neglect the worship of those protecting divinities of his labors, if he wishes to have them prosper. On the upper part of the block of marble is Apollo, driving the chariot of the sun, and on the upper part Ceres reaping corn in the field, which shows that this almanac was more particularly intended for farmers. It has been sent to Naples."

Paper Stock.

The Brooklyn *Times* says:—"A very extensive manufactory is now building in South Brooklyn, for the purpose of reducing any kind of fibrous substance, suitable for the purpose, into paper stock by the power of steam. The material is placed in a very powerful steam gun, the muzzle of which is kept closed until the proper moment, when, the catch being loosened, the material is blown out and reduced to a fine fiber. This is no new experiment It was tested several years since, and it was intended to make fiber for paper stock of the common Southern cane. The project was stopped by the war. Lately, however, arrangements were made for obtaining the cane from near Plymouth, N. C. The capture of that port by the rebels broke up that plan. We do not know what cheap material the company intend now to rely upon."

[Let them try corn husks. That is going to be a great staple for paper-makers. Beautiful, strong durable paper is now made of it. Samples can be seen at our office.—EDS.

Brush Fibers.

There is a great demand just now among brush-makers for some strong supple fiber which may supplement the present supply of piassaba or *bass* received from Brazil. Two strong fibers, the produce of different palms have been for some time received from the two ports of Para and Bahia. Of late less care has been given to the selection and preparation of these fibers in South America, and they are much mixed with waste and useless fiber. The piassaba fiber, and the so-called Mexican grass, the produce of the leaves of Agate, have quite revolutionized the brush trade by cheapening the cost and replacing bristles. Owing to the improvements in Russia, arising from attention to bacon and ham curing, bristles are less stout and plentiful than they used to be from wild hogs. The attention of residents in tropical regions may therefore be drawn with advantage to the demand for new fibers for brush-making, street-sweeping machines, and chimney-cleaning brushes.

[Brushes have for some time been made of whalebone splints, for certain purposes.—EDS.

SOME EFFECTS OF MAGNETISM ILLUSTRATED.

On the 10th of June, a lecture was delivered before the Royal Institution of Great Britain, by John Tyndal, Esq., F.R.S, M.R.I., Professor of Natural Philosophy, Royal Institution, on a "Magnetic Experiment," from which we take some extracts:—

THE CRACKLE OF MAGNETIZED IRON.

Here is a fine permanent magnet, constructed by Logeman, of Haarlem, and competent to carry a great weight. Here, for example, is a dish of iron nails, which it is able to empty. At the other side of the table you observe another mass of metal, bent like the Logeman magnet, but not like it, naked. This mass, however, is not steel, but iron, and it is surrounded by coils of copper wire. It is intended to illustrate the excitement of magnetism by electricity. At the present moment this huge bent bar is so inert as to be incapable of carrying a single grain of iron. I now send an electric current through the coils that surround it, and its power far transcends that of the steel magnet on the other side. It can carry fifty times the weight. It holds a 56 lb. weight attached to each of its poles, and it empties this large tray of iron nails when they are brought sufficiently near it. I interrupt the current: the power vanishes, and the nails fall.

Now the magnetized iron cannot be in all respects the same as the unmagnetized iron. Some change must take place among the molecules of the iron bar at the moment of magnetization. And one curious action which accompanies the act of magnetization I will now try to make sensible to you. Other men labored, and we are here entering into their labors. The effect I wish to make manifest was discovered by Mr. Joule, and was subsequently examined by MM. De la Rive, Wertheim, Marian, Matteucci, and Wartmann. It is this. At the moment when the current passes through the coil surrounding the electro-magnet, a clink is heard emanating from the body of the iron, and at the moment the current ceases a clink is also heard. In fact, the acts of magnetization and demagnetization so stir the atoms of the magnetized body that they, in their turn, can stir the air and send sonorous impulses to our auditory nerves.

I have said that the sounds occur at the moment of magnetization, and at the moment when magnetization ceases; hence, if I can devise a means of making and breaking in quick succession the circuit through which the current flows, I can obtain an equally quick succession of sounds. I do this by means of a contact breaker which belongs to a Ruhmkorff's induction coil. Here is a monochord, and a thin bar of iron stretches from one of its bridges to the other. This bar is placed in a glass tube, which is surrounded by copper wire. I place the contact breaker in a distant room, so that you cannot hear its noise. The current is now active, and every individual in this large assembly hears something between a dry crackle and a musical sound issuing from the bar in consequence of its successive magnetization and demagnetization.

MAGNETISM OF THE ELECTRIC CURRENT.

Hitherto we have occupied ourselves with the iron which has been acted upon by the current. Let us now devote a moment's time the examination of the current itself. Here is a naked copper wire which is quite inert, possessing no power to attract these iron fillings. I send a voltaic current through it: it immediately grapples with the filings, and holds them round it in a thick envelope. I interrupt the current, and the filings fall. Here is a compact coil of copper wire, which is overspun with cotton, to prevent contact between the convolutions. At present the coil is inert; but now I send a current through it: a power of attraction is instantly developed, and you see that it is competent to empty this plate of iron nails.

Thus we have magetic action exhibited by a body which does not contain a particle of the so-called magnetic metals. The copper wire is made magnetic by the electric current. Indeed, by means of a copper wire, through which a current flows, we may obtain all the effects of magnetism. I have here a long coil, so suspended as to be capable of free motion in a horizontal direction; it can move all round in a circle like an ordinary magnetic needle. At its ends I have placed two spirals of platinum wire, which the current will raise to brilliant incandescence. They are glowing now, and the suspended coil behaves, in all respects, like a magnetic needle. Its two ends show opposite polarities; it can be attracted and repelled by a magnet, or by a current flowing through another coil; and it is so sensitive that the action of the earth itself is capable to setting it north and south.

AMPERE'S THEORY.

There is an irresistible tendency to unify in the human mind; and, in accordance with our mental constitution, we desire to reduce phenomena which are so much alike to a common cause. Hence the conception of the celebrated Ampere that a magnet is simply an assemblage of electric currents. Round the atoms of a magnet Ampere supposed minute currents to circulate incessantly in parallel planes; round the atoms of common iron he also supposed them to circulate, but in all directions—thus neutralizing each other. The act of magnetism he supposed to consist in the rendering of the molecular currents parallel to a common plane, as they are supposed to be in a permanent magnet. This is the celebrated theory of molecular currents propounded by Ampere.

THE LENGTHENING OF IRON BY MAGNETIZATION

Is it a fact, that an iron bar, is shortened by the act of magnetization? It is not. And here, as before, we enter into the labors of other men.

Mr. Joule was the first to prove that the bar is lengthened. Mr. Joule rendered this lengthening visible by means of a system of levers and a microscope, through which a single observer saw the action. The experiment has never, I believe, been made before a public audience but the instrument referred to at the commencement of this lecture will, I think, enable me to render this effect of magnetization visible to everybody present.

Before you is an iron bar, two feet long, firmly screwed into a solid block of wood. Sliding on two upright brass pillars is a portion of the instrument which you see above the iron bar. The essential parts of this section of the apparatus are, first, a vertical rod of brass, which moves freely and accurately in a long brass collar. The lower end of the brass rod rests upon the upper flat surface of the iron bar. To the top of the brass rod is attached a point of steel; and this point now presses against a plate of agate, near a pivot which forms the fulcrum of a lever. The distant end of the lever is connected, by a very fine wire, with an axis on which is fixed a small circular mirror. If the steel point be pushed up against the agate plate, the end of the lever is raised; the axis is thereby caused to turn, and the mirror rotates. I now cast a beam from an electric lamp upon the mirror; it is reflected in a luminous sheaf, fifteen or sixteen feet long, and it strikes our screen, there forming a circular patch of brilliant light. This beam is to be our index; it will move as the mirror moves, only with twice it angular velocity; and the motion of the patch of light will inform us of the lengthening and shortening of the iron bar.

I employ one battery simply to ignite the lamp. I have here a second battery to magnetize the iron bar. At present no current is passing. I make the circuit, and the bright image on the screen is suddenly displaced. It sinks a foot. I break the circuit; the bar instantly shrinks to its normal length, and the image returns to its first position. I make the experiment several times in succession; the result is always the same. Always when I magnetize the image instantly descends, which declares the lengthening of the bar; always when I interrupt the current the image immediately rises. A little warm water projected against the bar causes the image to descend gradually. This, I believe, is the first time that this action of magnetism has been seen by a public audience.

I have employed the same apparatus in the examination of bismuth bars; and, though considerable power has been applied, I have hitherto failed to produce any sensible effect. It was at least conceivable that complementary effects might be here exhibited, and a new antithesis thus established between magnetism and diamagnetism.

MR. TYNDAL'S EXPLANATION.

No explanation of this action has, to my knowledge, been offered; and I would now beg to propose one, which seems to be sufficient. I place this large flat magnet upon the table; over it I put a paper screen; and on the screen I shake iron filings. You know the beautiful lines in which those filings arrange themselves—lines which have become classical from the use made of them in this Institution; for they have been guiding-threads for Faraday's intelligence while exploring the most profound and intricate phenomena of magnetism. These lines indicate the direction in which a small magnetic needle sets itself when placed on any of them. The needle will always be a tangent to the magnetic curve. A little rod of iron, freely suspended, behaves exactly like the needle, and sets its longest dimension in the direction of the magnetic curve. In fact, the particles of iron filings themselves are virtually so many little rods of iron, which, when they are released from the friction of the screen by tapping, set their longest dimensions along the lines of force. Now, in this bar magnet the lines of force run along the magnet itself, and were its particles capable of free motion they also would set their longest dimensions parallel to the lines of force—that is to say, parallel to the length of the magnet. This, then, is the explanation which I would offer of the lengthening of the bar. The bar is composed of irregular crystalline granules; and, when magnetized, these granules tend to set their longest dimensions parallel to the axis of the bar. They succeed, partially, and produce a microscopic lengthening of the bar, which, suitably magnified, has been rendered visible to you.

ANOTHER ILLUSTRATION.

But can we not bring a body with movable particles within an electro-magnetic coil? We can; and I will now, in conclusion, show you an experiment devised by Mr. Grove, which bears directly upon this question, but the sight of which, I believe, has hitherto been confined to Mr. Grove himself. At all events, I am not aware of its ever having been made before a large audience. I have here a cylinder with glass ends, and it contains a muddy liquid. This muddiness is produced by the magnetic oxide of iron which is suspended mechanically in water. Round the glass cylinder I have coiled five or six layers of covered copper wire; and here is a battery from which a current can be sent through the coil. First of all, I place the glass cylinder in the path of the beam from our electric lamp, and, by means of a lens, cast a magnified image of the end of the cylinder on the screen. That image at present possesses but feeble illumination. The light is almost extinguished by the suspended particles of magnetic oxide. But, if what I have stated regarding the lines of force through the bar of magnetized iron be correct, the particles of the oxide will suddenly set their longest dimensions parallel to the axis of the cylinder, and also in part set themselves end to end when the current is sent round them. More light will be thus enabled to pass; and now you observe the effect. The moment I establish the circuit the disk upon the screen becomes luminous. I interrupt the current, and gloom supervenes; I re-establish it, and we have a luminous disk once more.

A PRIZE ESSAY ON ANESTHETICS.—The following resolution was offered and passed by the Mississippi Valley Dental Association:—

1. *Resolved*, That a gold medal, not exceeding $100 in value, be awarded by the Association for the best essay on Anesthetics, to be approved by a committee of the Association.

2. That essays competing for the prize must be placed in the hands of the committee as early as Jan. 1, 1865.

The following persons compose the committee to report upon the essays presented:—J. Taft, George Watt, James Taylor, A. Berry, George F. Foote, Cincinnati.

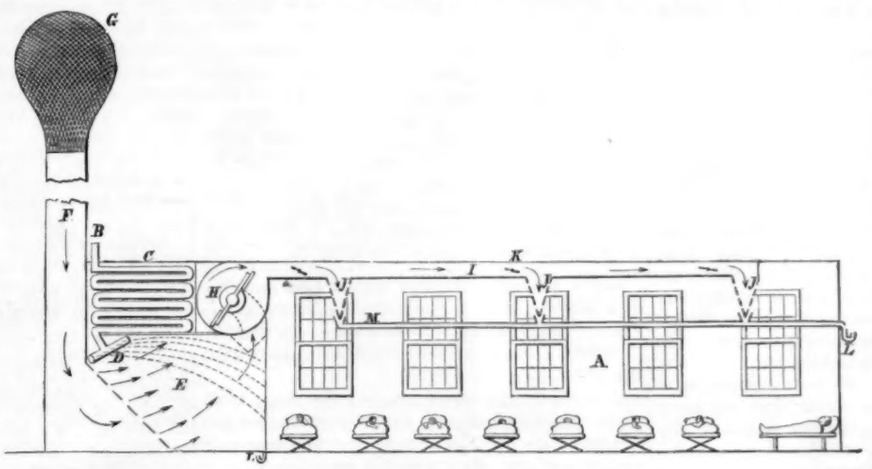
DREADFUL ACCIDENT AT THE PENNSYLVANIA COAL MINES.—An accident occurred near Schuylkill Haven, Phœnix Colliery, on Saturday evening, July 23, which resulted in the instant killing of twenty-one men. They were on a slope car coming out of the mines from their day's work, and when near the top of the slope the chain broke, letting the car run back a distance of six hundred feet on a slope of seventy-five degrees, killing all who were in the car.

MAXIMUM HEAT IN ENGLAND.—At Lenham Lodge, near Maidstone, Kent, Dr. George Hunsley Fielding, F.R.S., registered:—On Sunday, the 7th of June, 1846, the thermometer, in the shade, rose to the extraordinary hight of 94° Fahr., exceeding, by one degree, the heat of the 13th of July, 1808, which was considered to be the highest on record in that country.

Correspondence

Summer Ventilation of Hospitals.

Messrs. Editors:—Firemen have long been accustomed to secure fresh air by breathing through the fine spray which escapes from a jet of water; and an application of the same principle is strikingly seen in the plan recently adopted for restoring the air in diving bells. The principle has also been applied, with some success, in the ventilation of legislative halls, railway cars, etc.; but nevertheless it is yet in its infancy—a remark that may be applied to ventilation in general. Its most important application, namely, to hospitals, seems to have been overlooked or neglected; but could be effected without difficulty, as shown in the following engraving:—



A represents a hospital room, B a coiled pipe, receiving water under a heavy pressure, C a refrigerator containing ice and salt, D numerous jets projecting water with great force, E a chamber filled with finely divided spray of water, F an air inlet guarded by a screen, G so situated as to receive air where it is pure and has free circulation and sunshine, H is a fan which sucks air from the chamber, E, and discharges said air by pipe, I, and collanders, J, into the room, A. (The pipe, I, should be carried along the middle of the ceiling.) K is a damper under the control of the surgeon, M is a half-inch pipe conducting water of condensation from collanders, J, to the discharging siphon, L.

The injected water may be rendered slightly saline, so as to be capable of a temperature of 30° Fah., or less, without congealing, and so as also to exercise an antiseptic influence. Water from the open sea would probably be best of all; next to that, spring water. One effect of the process would be to precipitate all dust and other small impurities mechanically suspended in the atmosphere. The arrangement would operate with open windows or with ridge ventilation, because the density of the introduced air would cause it to seek the bottom of the room first, while its expansion would cause it to take up all superabundant moisture and to oppose the entrance of noxious emanations from without. A portion, at least, of mephitic matters which now settle on the walls and ceiling would condense on the outside of the collanders, J, and be carried off by the pipe, M.

The device is intended especially for optional and discretionary use in the heat of summer, but it may also be made available as part of the warming and ventilating apparatus in other seasons. The known vitalizing action of running water on air, under much less effective conditions than here proposed, leaves no room to doubt that its adoption would save many valuable lives.

Geo. H. Knight.

Cincinnati, Ohio, July 4th, 1864.

Sizes of Cone Pulleys.

Messrs. Editors:—To determine correctly the diameters of the different pulleys which comprise a pair of cones has been considered by mechanics as too difficult an operation for the workshop, and except in extreme cases they adopt the usual plan of making the diameters increase from the least to greatest in an arithmetical progression, producing an error greater or less, depending on the angle formed by the sides of the belt. I suggest the following simple method of finding the dimensions of a pair of cones which will give a result very nearly correct:—Suppose it be required to find the proportions of the two cones, the following sizes being given:—diameter of largest pulley on first cone, twenty-four inches; diameter of the corresponding smallest pulley on second cone, four inches; distance between the centers, four feet. Now let two points be marked upon a straight line, four feet apart, around one draw a circle of twenty-four inches diameter; connect these circles together by a line on each side to represent the belt; if these lines be measured and to their product be added that part of the circumference of both circles touched by the belt, the result will be its length, which, in this case is 142·01 inches. Next multiply the distance between the centers of the cones by 2—equal to 8 feet or 96 inches—this subtracted from 142·01, and the remainder divided by 3·1416, gives 14·65 inches, nearly, as the diameter of two equal pulleys to suit this length of belt; having drawn circles of this diameter around both centers, if it is desired to have a pulley intermediate between the least and greatest, we then divide the space between the circles into two equal parts, and describe other circles, one of which would have a diameter of 19·32 inches, and the one corresponding to it, 9·32 inches; this space may be divided into as many equal parts as it is desired to have intermediate pulleys.

The dimensions of a pair of cones proportioned by the erroneous method mentioned in the first paragraph, would be as follows:—Dimensions of large pulley, first cone, twenty-four inches; of corresponding smallest pulley, second cone, four inches; diameter of second pulley, first cone, nineteen inches; corresponding pulley, second cone, nine inches; when they should be respectively, 19·32, and 9·32 inches; the third size being the same on both cones would have a diameter of fourteen inches, which is 0·65 of an inch too small, and if a belt be cut the proper length to suit these, it would be 2·03 inches too short for the others. This is an extreme case, and so great an error would never be permitted to occur in practice, but it serves to show the fault which, under the most favorable circumstances, would only be less, and not entirely avoided. Mathematical precision may not be required in the proportions of a pair of cones, but the importance of having them nearly correct is obvious.

A leather belt should be oiled before being used, as that increases the friction and adds to its durability. New belts stretch about one-tenth of an inch to each foot of length, and it is always safe to cut them that much shorter than the actual length required.

Benjamin T. Luther.

Providence, R. I., July 20th, 1864.

[It will be seen that our correspondent aims to secure accuracy to correct the slovenly, slip-shod way of computing sizes, and which prevails in some workshops. In this effort we heartily concur, and shall take pleasure in publishing all letters bearing upon this important point.—Eds.

Preserving Fruit.

Messrs. Editors:—I noticed a timely article with the above caption, on page 9, current volume of the Scientific American, and its re-publication in Eastern prints and the *Public Ledger* of Philadelphia. Those familiar with the improved process of preserving in what are commonly known as patent air-tight fruit jars, as compared with the antiquated and unreliable process where corks and cement are used for stoppers, will accord with your decision in favor of the patent glass jars.

It is a just comment upon the statements of the Scientific American to add, that any improvement receives a suitable reward of commendation; but it is nevertheless true, that improvements falling of completeness you criticise in a manner best calculated not to discourage but rather to stimulate the inventor, by gently reminding him that another, and it may be still another progressive step is required to betaken before any reasonable claim can be set up to public approbation and support.

Your occasional review of particular and popular domestic articles—such as the fruit jar, as now improved, contrasted with their use in former times—may be relied upon by purchasers, in such cases, as indicating the best varieties the market affords.

Applying the foregoing observations to fruit jars and preserving fruit, in connection with your article in question, I deduce the following conclusions:—1st, That the greatly increased demand for fruit jars may be ascribed to their improved character, which have received, as they deserve, your commendation.—2d, It is hoped and believed that your popular criticisms upon the still existing, and in too many instances ruinous defects in fruit jars will result in their completeness; 3d, Verily, it is true, as you aptly suggest, that that jar having the most perfect neck, shoulder, and gasket, deserves to be, and will be accepted as the most desirable and marketable jar, provided, however, the jar will admit of being filled so that the vacuum or cavity of which you justly complain, shall substantially disappear. It is well known that as fruit cools it contracts and descends or settles down in the jar, leaving a great and permanent cavity at the top called "air-trap" and "mold nest," to the certain injury or ruin of the fruit. This mold is the bane of all attempts at successful fruit preserving. It is estimated that sixty per cent of the fruit put up in jars molds, and that fifty per cent of this, or one-half, is ruined. It should be remembered at all times, and especially now, with fruit at prospective and sugar at present fabulous prices, that the slightest quantity of mold is a loss to the consumer, as it can only be removed from the jar by taking with it a portion of the fruit, while its taint cannot be removed at all.

It must be borne in mind that where there is no cavity no mold can form. What we require, therefore, is a stopper or jar with a simple device attached, that after the fruit has cooled and settled to the bottom of the jar, will fill the cavity at its top with either the cold sirup of the fruit, or (cold) boiled water, and as it fills and closes, discharge the air therefrom, so that a perfect vacuum (which you say is impossible), may be closely approximated. There is no jar on the market competent to this performance. The economic difference in favor of such a jar, the amount of sugar, and quantity and quality of fruit saved, considered, would not be less than fifty per cent.

I might add some experience in respect of the different styles of gaskets or rubber rings, and joints in use, but as I have no desire to appear invidious, and no design but to include alike all jars as guilty of the same charge of incompleteness, I will dismiss the subject by adding, that we possess, in endless variety, climate, fruits and vegetables. Cultivation, too, by the aid of mechanical skill, has attained a degree of perfection. Now let us have our many excellent fruit jars improved to completeness in the manner suggested; and repudiate the unskilful resort to the use of pins, plaster, linen, beeswax, rosin, cement and coal tar, so that the value of our successful fruit-producing shall not be impaired by our imperfect fruit preserving.

Fruit.

[The idea suggested by our correspondent is a valuable one, but we should have been pleased if he had sent us his name with his article.—Eds.

A New Invention Wanted.

MESSRS. EDITORS :—If some one of your numerous readers will produce a simple and convenient device for raising and lowering the fire-grate in our common cooking ranges, he will confer a public favor, and find a ready sale for it. Range fires are placed some 12 to 15 inches below the kettle bottoms, which at times is necessary for the purpose of heating the ovens and water-back. But it daily happens in the work of the kitchen, that a sharp heat is wanted at the top of the range, and although a sufficiency of coals may be burning on the grate, the distance down is too great to make it effective. A new fire must be made, a bucket of coal used, and an hour's time required, which could be saved if the grate with its fire could be raised and lowered at pleasure. The invention should be made applicable to any and all ranges already in use. One-half the coal now used in my range could be saved by the use of such a device. Who will produce it? R. F. STEVENS.

New York, July 13th, 1864.

A Chance for the Ingenious.

MESSRS. EDITORS:—Will you be so kind as to inform us who manufactures good machines for cutting cooked meat, and their probable cost. We want a machine with an adjustable feed that can be made to cut boiled or dried beef (after the bone has been removed) into slices of variable thickness, from one-eighth to three-fourths of an inch; or, in other words, we want it cut into rations ready for the table. As you may very readily imagine, it is no small job to carve the meat for a hospital the size of this (2,620 beds for patients, exclusive of attendants) so tha tit may be served warm. We make a great saving by having the meat carved. We have a machine for hash and a mincer; and the steam-power and room for adding any kind of machinery we may want. By giving this your earliest attention you may very much oblige and administer to the comforts of our sick and wounded soldiers.

M. N. ELROD, A. A. Surg. U.S.A.

Jeffersonville, Ind., July 16th, 1864.

[If any of our readers know of such a machine they will please communicate with Dr. Elrod.—EDS.

MISCELLANEOUS SUMMARY.

AMONG the novelties recently introduced is a locomotive seat designed for the comfort of those who work at gardening, etc., where their hands need to be employed on or near the ground. It consists of a malleable iron foot-piece or sandal, which can be easily fastened to the foot by suitable straps. An oblique standard, with a seat made of wood, sticks into the foot-piece at the heel, properly secured, thus making a convenient stool, which can be carried about with very little inconvenience.

SEVERE SENTENCE.—Whatever else the Secretary of the Navy may have been remiss in, it cannot be said that he has lacked decision in punishing insubordinate engineers, or defaulting contractors. William J. Moffit, an acting third assistant engineer who was tried by court martial and found guilty of desertion, has been disrated and reduced to serve as a first-class fireman for two years, during which time he is to forfeit all pay now due him for former services.

RAIN AT LAST.—The country has been rejoiced by a series of refreshing showers which were greatly needed. Crops have suffered severely from the prolonged drought, and the pasturage is so poor that the dairymen complain sadly of short supplies. We do not notice that the supplies are diminished at all, but the quality seems to have suffered greatly. Despite the drought there is as much water in our milk as there ever was, and far too much to be wholesome.

IN France, the waste steam from the locomotives is made to heat the cars in the train behind. It is conducted from the escape pipes through tubes, which inside of the cars are of copper, but outside are of vulcanized india-rubber, with couplings which can be readily managed.

BREECH-LOADERS IN SHERMAN'S ARMY.—Rousseau, in his raid of 400 miles, which was attended with such brilliant results, had a force of 2,700 men, 1,000 of whom were armed with Spencer's breech-loading rifles.

THE INVISIBLE WRITING.—The plan of writing with rice-water, to be rendered visible by the application of iodine, was practiced with great success in the correspondence during the late war in India. The first letter of this kind was received from Jellalabad, concealed in a quill. On opening it, a small paper was unfolded, on which appeared only a single word, "iodine." The magic liquid was applied, and an important dispatch from Sir Robert Sale stood forth.

PRESERVATION OF CHLOROFORM.—It requires but a short time for chloroform which is exposed to the sun's rays to undergo decomposition, hydrochloric acid being developed, and a strong odor of chlorine being present. This is prevented if the cloroform is kept in the dark; and when it has undergone decomposition by exposure, M. Boettger finds that it may be easily purified by shaking it up with a few fragments of caustic soda. As long, indeed, as it is in contact with the caustic soda it may be preserved for an indefinite period in diffused light.

DIGITALINE, discovered in 1830 by Le Royer in the *digitalis purpurea* or foxglove, is a plant possessing an electric action on the pulsations of the heart, the vital functions of which it can stop entirely, thereby occasioning death. It is prescribed in very small doses for palpitation of the heart, but even then it must be used with caution, because it accumulates in the system, and the practitioner may sometimes be surprised at the sudden death of his patient even some time after he has left off the use of it.

AMONG the emigrants who arrived here recently from England, were about a hundred factory girls, whose passage had been paid by the Lawrence mill companies. The girls were sent forward to Lawrence at once.

M. BOUSSINGAULT has recently laid the result of a highly interesting series of experiments on vegetation before the Academy of Sciences. The most important fact is, that while plants, when exposed to light, fix carbon, hydrogen, and oxygen, when placed in darkness they eliminate these elements.

On the Tempering of Steel.

A rod of steel in its hardest state, is broken almost as easily as a rod of glass of the same size, and this brittleness can only be diminished by diminishing its hardness. In this management consists the art of tempering. The colors which appear on hardened steel, previously brightened, are, a light straw color, dark straw, gold color, brown, purple, violet, and deep blue; these colors appear in succession as the hardness gets reduced. There are various ways of tempering steel, dependent upon the nature of the articles, likewise the quantity of them, for, in a number of instances, a great many articlss may be tempered as expeditiously as a single one. To temper any article to color it must be brigutened after it is hardened, and then laid on a plate of hot iron, or upon a surface of melted lead, or in hot sand, or burning charcoal, or held in the center of an ignited iron ring, or in the mouth of a furnace, or on a gas stove made for the purpose. But in constructing a furnace for hardening with, it is a good plan to have the top of the furnace made with a good stout plate of cast-iron, so that the plate will always be hot, and ready to temper anything that can be done on a plate and it will do to put the sand on, and for many other useful purposes, especially if the plate be moveable, and a small opening left in the front of the furnace from the top down to the mouth, just to admit the tongs. If at any time hot lead is required the plate can be removed, and the pot of lead placed in the furnace, the plate can then be put back into its place. The opening in the front will be very convenient for getting the articles into the lead, and when the opening is not required it may be stopped with a piece of sheet-iron. With a furnace of this description it is surprising the amount of hardening and tempering that can be accomplished; for large things take a considerable time in heating, and while the hardener is waiting for them getting hot, he may be engaged tempering on the top of the furnace, and still have his attention on the other articles. In the way of case-hardening, a man's sole attention is not required on the articles all the time they are in the fire, as many things lie for hours before they are ready to put in the water, and he may then be engaged in tempering; but if this plate should prove too hot for small articles, another piece of plate may be laid on the top of it, and the articles laid on the the top plate. It is not every one, however, that has large quantities to temper, so as to require a furnace or tempering stove; but merely a few articles occasionally, such as hobs, taps, dies, drifts, rimers, chasers, drills, &c., for the use of the shop, in such cases the uses of the furnace can be dispensed with; for a small quantity they may be heated in a common smith's fire, and hardened in the usual way: taps may then, after they are brightened, be held inside of an ignited iron ring till a dark straw-color appears on the surface, and then plunged into cold water; this is the best temper for general use, but if it is intended for any express purpose, for cutting things that are extra hard, in such cases a light straw color or yellowish white will be required. Hobs require to be a yellowish white, for as they are always required for cutting steel, it is necessary they should be hard; fluted rimers may be held inside of an ignited ring, and tempered to a light straw color. Dies may be hardened in the usual way, and when brightened, placed on a cold plate of iron, and the plate and the dies put upon a large piece of ignited iron and tempered to the same color as a tap—a straw color. Chasers may be hardened in the usual way, and placed upon an ignited bar, keeping the threads some distance off the bar, and tempering to a light straw, or yellowish white. Drills may be hardened in the usual way, and the cutting part of the drill tempered to a straw color, while the rest is not higher than blue, so that its liability to break when in use is greatly diminished. Chisels may be hardened in the usual way, and tempered to a violet color; but if intended for cutting stone, a purple is required. Drifts may be hardened in the usual way, and tempered to a brown color. Milling cutters may be hardened in the usual way, and tempered to a yellowish white. Saws may be hardened in the usual way, in which state they will be brittle and warped: they may then be put into a proper vessel with as much oil or tallow as will cover them, and placed over a fire and boiled to a spring temper, or they may be smeared with tallow, and heated, till thick vapors arise and burn off with a blaze; they must then be hammered flat, and afterwards blued. But if they are intended for cutting hard substances, such as steel or iron, they must be tempered to a straw color.—*George Ede.*

The Twenty-inch Gun.

The great twenty-inch army gun recently finished at the Fort Pitt Works has been placed upon the trucks which were built expressly by the Pennsylvania Railroad Company in their shops at Altoona, to convey it to its destination, which are constructed in the ordinary manner, with the exception that everything about them is of the most substantial material, and a bridge extends over both trucks, the ends resting upon heavy beams across the center of each truck. Before the immense mass of metal was suffered to rest upon the bridge, strong props were placed under the beams, as a precautionary measure, and so severely are these props taxed that it is now uncertain whether they can be removed at all. It is feared that if they are knocked from under the beams the trucks will break down or become so strained as to render them unsafe. The gun has remained in this awkward position in front of the Works, for twenty-four hours past, and we are not advised as to what course will be pursued. The general impression is that the trucks have proved a failure. One of the reasons alleged is, that they have not been properly hog-chained; but the skilled workmen who designed them will hardly concede this point, unless upon the most satisfactory evidence. In the mean time the "big gun" is visited by hundreds, who can get a full and satisfactory view of it gratis. It was weighed on the new mammoth scales erected at the Works for that purpose, and was found to contain 116,497 pounds, or a fraction over *fifty-eight tuns.* Juveniles, aged from ten to fifteen years, were amusing themselves to-day, in crawling into the bore on their hands and knees. A good-sized family, including pa and ma, could find shelter in the gun—and it would be a capital place to hide in case of a bombardment.

The twenty-inch navy gun, recently cast at the Fort Pitt Works is now in the turning lathe, and is slowly but surely coming into shape.—*Pittsburg Gazette, 23d inst.*

The Shoeburyness Ordnance Experiments.

On Thursday week quite a new branch of the inquiry was entered upon—viz., experiments to test the destructive effect of the rival weapons against armor-plated defenses, the test selected being the well known *Warrior* pattern (4½-inch plates supported by strong iron ribs). The original Armstrong gun—the breech-loader—was very properly withdrawn from the contest by Sir William. Passably good as a shell-gun against structures of wood, it wants the penetrative power necessary to enable it to cope successfully with armor-plate defenses. Originally intended to be fired with 14 lbs. of powder, this charge was found too great, and was reduced to 12 lbs.; the recoil still proving excessive, the charge has been still further reduced to 10 lbs., which is found as much as the weight of the gun, 60 cwt., is adapted to bear.

The weight, and bore, and charge of the two 70-pounder guns were as follows:—The Armstrong shunt, bore 6·5 (being 1-10th-inch more than that of the old service 32-pounder); weight, 75 cwt., charge 14 lbs.; bursting charge of shells, 2 lbs. The Whitworth bore, 5 inches; weight, 76 cwt.; charge, 12 lbs.; bursting charge of shells, 11 lbs. 14 oz.

Range 800 yards.—First round, with solid steel shot.—Whitworth hit middle plate, and penetrated its own depth, viz., 13 inches; rear end of shot broke off and flew out. Shunt missed.

Second round, with solid steel shot.—Whitworth, penetration as before. Shunt drove in plate, 4·2, bulging, but not quite penetrating. Third solid steel shot from shunt struck left hand top corner of target, breaking away a piece; shot glanced off; effect estimated to be the same as before.

Third round, with steel shell.—Whitworth drove in plate 4½ inches, shell exploded, scattering fragments in front of target. Shunt indented plate 2½ inches; shell exploded, but though diligently searched for, could not be found.

On Friday firing commenced at a range of 50 yards.

First round.—Shunt; spherical steel solid shot, weighing 34 lbs., fired with a wooden sabot, and 18 lbs. of powder; penetrated plate and broke up, the rear of the shot being 3 inches below the surface of the plate. Whitworth: hexagonal steel shot, with 12 lbs. of powder (same as previous day), penetrated about 10 inches, leaving rear end of shot sticking out 3 inches; head of shot split.

Second round, steel shell.—Shunt, drove in plate 10 inches and rebounded 17 yards, not burst; knocked off ten bolt-heads from the back of the target, and started bolt in front. Whitworth entered 4½ inches, burst, leaving end sticking in.

Range 600 yards.—First round.—Whitworth lodged in middle plate, leaving rear protruding 4 inches; penetration consequently 9 inches; did not break. Shunt lodged leaving rear protruding 1½ inches, showing 9 inches penetration.

Second round, steel shell.—Whitworth entered plate and burst, blowing out the rear, and leaving front part of shell imbedded; depth to broken surface 3 inches. Shunt: indentation, 1 inch; shell exploded, and blew the rear end between 300 and 400 yards backwards, nearly in a line with the battery.

The shell from the shunt gun which disappeared in so incomprehensible a manner on Thursday, was found on Friday 500 yards in advance of the target, and nearly in a line between the target and the battery. Coupling this with the fact of one being blown backwards nearly as far on Friday, it becomes evident that steel shells, which divide in two parts annularly instead of shattering into fragments, may become dangerous to the parties firing them in cases where they do not penetrate.

The general result of these experiments is sufficiently remarkable to prove that we know very little indeed about guns and gunnery. Thus we find that with the same charge and projectile, the penetration of the Whitworth shot was greater at 800 yards than at 50! With the shunt gun, too, shell penetrated more deeply than solid shot.

Gunners state that the velocity of projectiles increases after they have left the gun for a short space. Hitherto the statement has been denied, but these experiments apparently open up the possibility of the correctness of the theory after all.—*London Mechanics' Magazine, July* 1.

Law Expenses.—In the paraffine oil case, Young vs. Fernie, Sir Hugh Cairns for the respondents, recently stated that the costs to his clients already amounted to £15,000 ($75,000.)

Electro-Plating.

In France, the electro-plating is regulated by law; every manufacturer being required to weigh each article when ready for plating in the presence of a comptroller appointed by the Government, and to report the same articles for weighing again when the plating has been done. In this way the comptroller knows to the fraction of a grain the amount of the precious metal that has been added, and puts his mark upon the wares accordingly, so that every purchaser may know at a glance just what he is buying.

As to the amount of silver consumed in ordinary plating, a word: An ounce and a half of silver will give to a surface a foot square, a coating as thick as common writing paper. And since silver is worth $1,25 per ounce, the value of the silver covering a foot square would be about $1,87. At this rate, a well-plated teapot or coffee-pot is plated at a cost in silver of not more than $1,50 to $2,00. The other expenses, including labor, would hardly be more than half that amount.

Electro-gilding is done in like manner. The gold is dissolved in nitro-hydrochloric acid, washed with boiling nitric acid and then digested with calcined magnesia. The gold is deposited in the form of an oxide, which, after being washed in boiling nitric acid, is dissolved in cyanide of potassium, in which solution the articles to be plated with gold, after due preparation, are placed. Iron, steel, lead and some other metals that do not readily receive the gold deposit, require to be first lightly plated with copper. The positive plate of the battery must be of gold, the other plate of iron or copper. The process is the same as that above described.

The popular notion is, that genuine electro-gilding must necessarily add a good deal to the cost of the article plated. This is erroneous. A silver thimble may be so handsomely plated as to have the appearance of being all gold for five cents, a pencil-case for twenty cents, and a watch case for one dollar. An estimate of the relative value of electro-gilding, as compared with silver-plating, considering the cost of material alone, is about 15 to 1.—*J. W. Hoyt.*

Pacific Cotton.

The island of Tahiti is to be added to the catalogue of lands which are producing cotton. The experiment in its growth has been eminently successful there. Surrounded by water, the atmosphere is necessarily moist; near the equator, it is abundantly hot, and the only remaining requisite, labor, is secured from the natives through the great rewards which it secures. So great has been the success of the experiment, that increased preparations are making for another year.

The new line of steamers about to commence running between New Zealand and Panama will carry this crop to its Atlantic shipment, whence it will principally go to Europe. Many of the South Sea islands, as favorably situated as Tahiti, will also engage in the cultivation, and lessen existing cotton rates. They are now occupied by cannibals and savages. These will be reclaimed by enterprising emigrants, induced by the natural facilities for cotton-growing and the high prices paid for the staple; and thus the middle Pacific will become civilized and productive. All of the Pacific islands are possessed of great agricultural as well as commercial advantages, which a little more time will develop and reward. A late Panama steamer brought two thousand and six bales of Pacific cotton, of which eleven hundred were shipped to New York.

The Bessemer Process Extending.

The Birmingham correspondent of the *London Engineer* says:—"The expected prospectus for the conversion of the Ebbw Vale Iron and Coal Works into a limited joint-stock company was issued on Tuesday afternoon. The capital is to be four millions sterling, in shares of £50 each, and Messrs. Abraham Darby and Joseph Robinson, the chief acting proprietors, are to continue their connection with the undertaking by joining the board of direction. They also subscribe for £500,000 in shares. The property and plant are of enormous extent, and the annual yield of coal and iron is of proportionate magnitude. The directors have agreed for a license for the manufacture of steel by the Bessemer process, which, from the peculiar sources they possess, they will be enabled to produce in very large quantities and at a price that, in comparison with other works, will insure to them the same advantages in the manufacture of steel rails as the Ebbw Vale Company have so long enjoyed in respect of iron rails."

In a few days it is to be hoped that the *Dictator* will set out on her trip across the ocean.

New Self-Breech-loading Cannon.

The Pittsburgh *Chronicle* thus describes a new cannon invented by Mr. John Lee, of Massillon, Ohio:—"The gun we examined is about six feet long, and weighs upward of a thousand pounds. The bore is 3,716 inches and throws a five-pound spherical shot, or a ten-pound elongated ball, three-fourths of a mile, with charge of powder of eleven ounces. The powder and ball are contained in a tin cartridge inside of which is placed two percussion caps. The charge is laid on a morticed groove which is raised to a level with the outside of the gun by means of a lever or crank, and lowered to the chamber of the cannon in the same manner. The gun is charged by a breech-pin, which is operated at the same moment the ball and cartridge is lowered to the chamber, immediately after which the breech is closed, and the shot fired by simply striking on a spring, which explodes the caps inside the cartridge. The operation of firing the gun can be repeated at the rate of from fifteen to twenty times per minute, without danger of explosion or the necessity of a person to attend the 'vent.' These guns can be made of any size and caliber, and will throw a ball from two and a half to three miles. The rapidity with which they can be fired, and the safety which attends the same, renders them peculiarity adapted to our present mode of warfare. Mr. Lee has had his gun on exhibition in Washington City, where it was pronounced a useful invention by army and navy officers, all of whom recommended it highly. It is certainly one of the most wonderful instruments of destruction introduced since the commencement of the present war, and all who are interested in such matters should visit Messrs. Macintosh & Hemphill's establishment and examine the gun, as we have but little space to present its merits. We understand Messrs. Lee & Kier will present a battery of these guns to the Government."

Paper and Cloth from Corn Husks.

In Austria they make very superior paper out of corn husks, but we see by the Washington *Chronicle* that the Commissioner of Agriculture has received some specimens of bleached and unbleached crash and oil cloths made from the same material. All portions of the corn husk are converted into paper-stuff, spinning stuff, or husk meal, which is mixed with common flour. Nineteen per cent of paper fiber, ten of spinning material, and eleven of feed stuff are obtained, together making forty per cent leaving a refuse of sixty per cent, much of it fine fiber and gluten, which may yet be filtered and utilized. The manufacture is said to be very profitable. The paper is equal to the finest linen paper, and some of it is thought to be a good substitute for parchment.—*Phil. Ledger.*

[We have seen these articles and have samples on view at this office. They are all they are claimed to be.—Eds.

Prices of Goods—Attention Manufacturers.

It will be seen from the subjoined section of the new internal revenue act, which was passed on the 30th of June last, that in cases were goods have been sold or contracted to deliver in future, after the passage of the bill, the manufacturer can add to the price of such goods such sums as will be equivalent to the duty imposed on the goods by the passage of the act referred to.

Sec. 97. *And be it further enacted*, That every person, firm or corporation, who shall have made any contract prior to the passage of this act, and without other provision therein for the duties imposed by law enacted subsequent thereto, upon articles to be delivered under such contract, is hereby authorized and empowered to add to the price thereof as much money as will be equivalent to the duty so subsequently imposed on said articles, and not previously paid by the vendee, and shall be entitled by virtue hereof to be paid, and to sue for and recover the same accordingly.

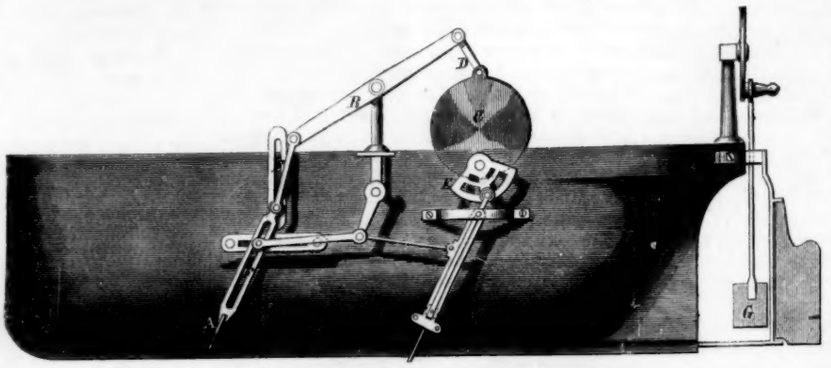
In Boston many agents and others are charging and collecting the extra percentage.

Horses! Horses! Horses!

The Government is in urgent want of horses for the cavalry service. All persons who have any suitable for sale are requested to bring them forward without delay—at once—to Capt. George T. Browning, A. Q. M., office No. 18 State street. One hundred and sixty-five dollars will be paid for every animal found suitable. Immediate attention to this notice is requested.

Harris's Feathering Lever Paddle.

In the year 1788, John Fitch ran a steamboat on the Delaware river which was propelled by paddles instead of wheels. These paddles were hung in a frame, and in principle were similar to those shown in the accompanying engraving. From that time up to the present hour inventors have been busy in improving the mechanical action of the details, and we have illustrated herewith the latest conception in the line. The plan alluded to is to suspend the paddle, A, from the end of a working beam, B, said beam being operated by an eccentric, C, having a link, D, connecting to the beam. When the eccentric is revolved by the main engine, the paddles receive a plunging motion, and they are also moved horizontally by the vibration of the quadrant, E, upon its axis. During these actions the paddles are guided by certain slots, F, so that they move over the same path each time. It will be seen also that there is a paddle, G, at the stern placed between the rudder and stern-post so that the action of the rudder is facilitated. Various modifications of this plan are shown in the Letters Patent of the inventor, but this one is a fair example of them. It is claimed for this plan of propulsion that much more of the effective power of the engines is utilized than with others, that there is less back water and no jar, and that it is an economical substitute for the common wheel.



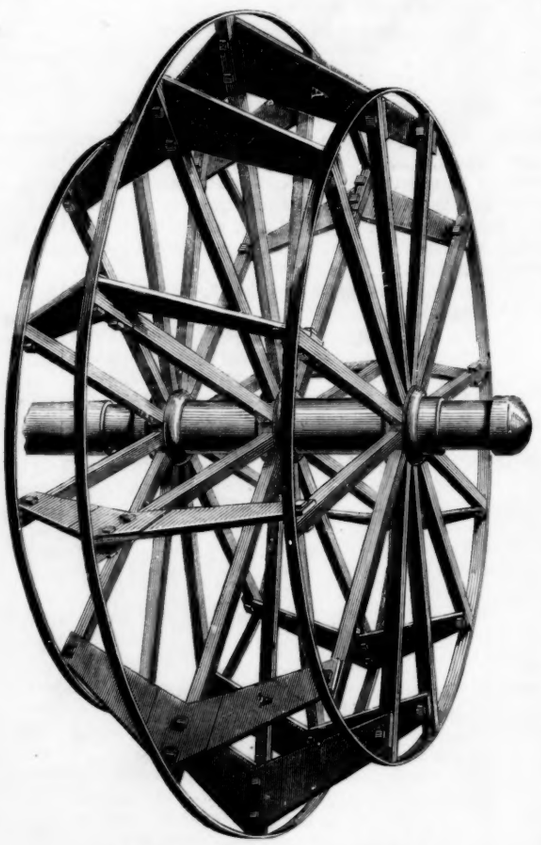
HARRIS'S FEATHERING LEVER PADDLE.

It was patented in the United States, by John Harris, of England, on June 21st. 1864, through the Scientific American Patent Agency. For further information address the inventor at 147 St. Joseph street, Montreal, C. E.

Improved Paddle-wheel.

It is notorious that the common paddle-wheel with straight buckets expends a great portion of the power applied to it, in entering and leaving the water. The angle at which flat buckets enter produces a great shock on the boat and wheel, and in large wheels the back-water raised on the exit of the bucket becomes a serious disadvantage. The wheel shown in this engraving is constructed with a view to obviate the trouble previously mentioned, and has its buckets made in an angular form, as shown at A.

By this method when the bucket enters, the parts in contact with the water are very small and the penetration is gradual, and easy instead of violent. For the same reason the buckets when they emerge carry but a small percentage of the water up with them, thus utilizing the power to a great extent. This wheel is cheaply constructed and very strong. It is less liable to get out of order than the ordinary straight-bucket wheel since it works easier and with less violence than the other. It can be applied to new or old boats without any alteration of the boats themselves, and with other advantages it will, it is claimed, be a more efficient propelling instrument than the ordinary wheel.



COMSTOCK'S PADDLE-WHEEL.

This invention was patented on May 10th, 1864, through the Scientific American Patent Agency, by Albert M. Comstock, of Old Lyme, Conn.; for further information address the inventor at that place.

IMPROVEMENT IN THE BESSEMER PROCESS.

Mr. Bessemer has recently patented some improvements in his process for making steel directly from cast-iron by forcing air through the molten cast-iron and thus burning out a portion of the carbon:—

"When steel or malleable iron is so made from pig iron, a reverberatory furnace has generally been employed to melt the crude metal, and it has been found that a loss in the original weight of metal takes place in such melting process, and also that some of the carbon present in the iron is lost, while the proportion of sulphur it contains is augmented. Now the first part of the improvements has for its object the lessening of the quantity of iron and carbon lost in the melting process, and also the lessening of the quantity of sulphur absorbed, while at the same time the quantity of fuel consumed in the melting furnace is diminished.

"In order to carry into practical operation the first part of his improvements, Mr. Bessemer employs a reverberatory furnace constructed in the usual manner when employed for melting pig iron, excepting at that end of it which is nearest the chimney, where it is provided with a second hearth or chamber having a flat or nearly horizontal bottom, through which the flames and heated products of combustion pass on their way to the chimney; this chamber may, if desired, be a simple elongation of the bank or part on which a portion of the metal is to be melted, but it is preferred to separate the melting chamber from the second chamber by a dip in the roof, so as to contract the aperture leading from the first to the second hearth. The bed of the second hearth may, if desired, be made movable on wheels, so as to facilitate the removal of the pig metal, and convey it to the converting vessel."

The iron in the second chamber is heated by the hot gases from the furnace, while the iron in the first chamber is being melted. The portion which is merely heated absorbs less sulphur from the coal than that which is melted. The two portions are mixed together in the converting vessel, and when the blast of air is forced through the mass, the heat generated by the combustion of the carbon in the molten portion completes the fusion of the rest. The article in the London *Engineer*, from which we obtain these facts, concludes as follows:—

"In the manufacture of malleable iron and steel from crude iron, or from refined or partially refined iron, by forcing atmospheric air into and below the surface of the fluid metal, the air has hitherto been simply conveyed from the blast engine or air vessel, in a cold or in a heated state, direct into the converting vessel without otherwise altering the properties or gaseous constituents of the air so employed, excepting in those cases where steam has been mixed therewith; but Mr. Bessemer has found that the molten iron, and the substances incorporated therewith, may be acted upon more or less advantageously by charging or impregnating the air with the vapors of acids, alkaline or saline fluids, or hydro-carbons, or by passing the air through or between any solid substances capable of vaporizing or in part vaporizing or altering the properties of the air with a view to act upon or combine with the substances present in the crude metal, and thus further refine, purify, or improve its quality, the air and the fluid or solid substances among which it is passed being either in a cold or in a heated state, as may be found preferable. In carrying this system into practical operation it is preferred to line the lower part of the air receiver, which is in communication with the blast engine, with lead or with pottery-ware, or with other substances not easily destroyed by the fluids to be employed therein, the air from the blast engine being conveyed through perforations situated below the surface of such fluid, and being allowed to bubble up through it, and thus become more or less altered in its properties and chemical constituents prior to its passage through the tuyeres into the molten metal."

If any of our readers are disposed to ask what is meant by vaporizing or in part vaporizing the properties of the air, we shall have to refer them to Mr. Bessemer.

Friction Matches.

The manufacture of friction matches was begun in this country in 1835. The Germans claim to have discovered the process at about the same time, and it is probable that, like many other discoveries and inventions, both parties developed the idea simultaneously. One firm in Boston, engaged in this business, consume at their different factories over five thousand cords of wood per annum, mostly sapling pine. They make fourteen million four hundred and forty thousand matches per day, and under the new law, which requires a one-cent stamp for each bunch, they will pay a tax of $1,400 per day, or nearly $450,000 per annum. The revenue which the Government will derive throughout the country, from this apparently small branch of manufactures, will not be less than $3,500,000 per annum.

Two little girls recently died at Mile-end, England, through sucking matches made with phosphorus.

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Contents:

(Illustrations are indicated by an asterisk.)

MECHANICAL INSPIRATIONS.

There is hardly an implement in daily use that has not undergone such thorough and radical change that it is virtually another thing. A walk through the hardware and tool store is by no means time thrown away. Having occasion to use a carpenter's bit, a few days since, we stepped into a store and upon inquiring for the article were shown one. It was not what we wanted, and we said to the proprietor: "If you had a thing like a gimblet, for instance, that would bore a dozen holes with a little alteration, that would be just the thing," "I have it," he replied, and produced precisely what we have described; a steel shank about eight inches long, having a feed-worm at one end and a number of detached cutters which could be screwed on or off to cut certain sized holes. It was complete. Nothing could be more so. A dozen holes of all sizes within an inch can be bored, and the bulk of the tools when packed is not over an inch square by eight inches in length. For family use, for amateurs, or even mechanics, such tools are invaluable.

This is not a solitary instance. Obstinate corks that lie between one and the sparkling contents of a wine or soda bottle need no longer be tugged at in vain till one is red in the face. A little gentle exercise, provocation of appetite, and a twist of the wrist brings out the stubborn guardian so rapidly that the very wine laughs to see how neatly it was done. The new cork-screws accomplish all this, and though it may seem trivial to enlarge upon, it is not trivial to the proprietors of the patents, who find ready sale for all they can manufacture. It is just in these little things, so called, that shrewd ingenious men find a quick return for their outlay of time and capital.

The reader may have seen of late a blacking box, which has a wooden bottom and cover with tin sides. This box, or its origin, has a curious history. The inventer was in our office recently, and said that when the war broke out his legitimate business was ruined. He argued that if the war was the occasion of his misfortune, it might also be turned to his advantage, so 'he thought and thought" as the saying is, to little advantage.

At last the inspiration came.

He was in a friend's store one day when he saw a blacking box, was told of the demand and high price of tin, and then he set his wits to work. He had the idea, but not the machines, for without these to manufacture them rapidly, the invention was valueless. In company with another person he hired a room in the Harlem railroad buildings, in this city, and in six months had the machines ready at a cost of many thousand dollars, about all the available means he had. Nothing daunted he persevered, and in a short time sunk eight hundred more. From that time the business prospered, so that he now assures us that for four years to come he has orders enough to keep him busy. The box saves, we are told, the importation of thousands of dollars worth of tin annually, and affords occupation to numbers of females in an entirely new branch of employment. The price is far below that of tin boxes, being afforded we are told, at $1·25 a thousand, which is almost incredible.

May not this be styled a mechanical inspiration of the first degree? And is not such an individual in one sense, no doubt unintentionally, a benefactor? Most assuredly.

There are countless instances in the economy of the arts and sciences where similar inventions might be used to advantage. All men are not inventors, but there are few in manufacturing business of any kind who do not feel that in the possession of a machine for doing a certain branch more rapidly they would have great advantage over competitors. Manufacturers should make their wants known and they will not long be without the object of their desires. And not they alone but all who take an interest in substantial progress, who are friends to advancement, should endeavor to improve the tools, the materials, the processes and the character of the mechanic arts.

BREECH-LOADING REPEATING RIFLES.

This war will have been waged in vain if we learn no lesson from it. Ever since it flamed forth in its fury, loyal inventors have been busy in striving to produce the very best weapons that their skill was equal to, but in many instances they have been met with discouragement, and even insult, from the very persons whose duty it was to aid them.

If one element in successful warfare is to dispose of the enemy, whether by killing outright or maiming them as much as possible, then a weapon which will do this most effectually should be used. Humanity, no less than the triumph of a just cause, demands the employment of an implement of death which shall disable and terrify the foe.

The Springfield rifled musket is a good service-arm, and as well made as the skill of modern machinists is able to construct it, but there are many shots fired from it before a rebel is killed, and this because it is a muzzle-loader. When one ball has been fired it must be re-loaded, and then the assailed has at least an equal chance with the assailant.

The romance of war, if any there be in the horrid calling, lies in a handful of men putting a host to flight, or holding at bay numbers far exceeding them. It is enough to rouse the enthusiasm of the most stoical and indifferent, to read accounts of engagements, wherein the valor of our troops provided with efficient weapons, thrashed whole regiments of foes. Time and again during the progress of the war reports of the utility of breech-loading rifles have been chronicled in the columns of the daily press, and yet to-day the proportion of our armies furnished with guns of this class is so small as to say that they are practically ignored by our officers. What is the reason for this? Surely officials cannot always be right and practical people wholly wrong.

When weapons of this class were first introduced they were complicated in construction and liable to derangement; in short, not suited to rough use or a battle-field. Time and experience, however, have taught inventors many things, and those in authority may—if they examine into the merits of the breech-loaders—have occasion to materially change their ideas on the subject. There is no reason to argue, however, that officials are ignorant of the virtue of breech-loading small-arms. Some regiments have been provided with them and the superiority of the weapon and the efficiency of the troops over others without them, has been too marked to escape notice or be ignored.

THE Mount Anthony Observatory at Bennington, Vt., will soon be ready for use. Its height is one hundred and twelve feet.

IRREGULAR ACTION OF GUNPOWDER.

On another page, will be found an account of the continued progress of the trial at Shoeburyness, between the Armstrong and Whitworth guns. The trial has now reached its most interesting stage, the practice against armor plates having commenced; though guns of only moderate size have yet been used, the largest being 6½ inches bore. Some of the results in this trial are very curious, such as the rebounding of a steel shell from the iron target backward 500 yards towards the gun from which it was fired, and the deeper penetration of hollow shell than of solid shot into an iron plate. The last mentioned result may be due to the higher velocity produced by the action of an equal pressure on a lighter projectile.

There is always a liability, however, to great variation in the force of gunpowder burned under different conditions, from the varying action of the chemical forces involved in the combustion. Five elements enter into the composition of gunpowder. These are sulphur, carbon, oxygen, nitrogen, and the metal potassium; the last three being combined together as nitrate of potash. When these substances are mechanically mixed together as they are in gunpowder, as long as they are kept cool they undergo no mechanical change, but if they are highly heated, the elements in the nitrate of potash are separated, and they enter into new combinations with each other and with the sulphur and carbon, forming substances with properties entirely different from the properties of gunpowder.

The point to which we call attention is this: The substances formed in the combustion of gunpowder vary with the conditions under which the powder is burned. In the elaborate researches of Bunsen the powder was shaken from the end of a whip-stock into a retort, and burned one grain at a time—not under pressure. Under these conditions the five elements combined to form fifteen substances, in the following proportions, as shown by Bunsen's analysis:—

SOLIDS.

Sulphate of potassa	42·20
Carbonate of potassa	12·60
Hyphosulphite of potassa	3·20
Sulphide of potassium	2·10
Sulphocyanide of potassium	·30
Nitrate of potassa	3·70
Charcoal	·70
Sulphur	·10
Carbonate of ammonia	2·80–67·70

GASES.

Nitrogen	9·90
Carbonic acid	20·10
Carbonic oxide	·90
Hydrogen	·02
Sulphide of hydrogen	·18
Oxygen	·14–31·24
Total	98·94

But if the powder is burned in a confined space so that the pressure, and consequently the temperature, will be very high, it is supposed that only three substances will be formed, sulphide of potassium, carbonic acid, and nitrogen; that the chemical changes would be as follows:—

$$KO,NO_5+S+3C=$$
$$KS+3CO_2+N$$

In this case the proportions would be—

Sulphide of potassium	40·75
Carbonic acid	48·88
Nitrogen	10·37

It will be seen that the gases form 60 per cent in place of the 31 per cent produced in Bunsen's experiments. Some analyses by eminent chemists have discovered very nearly these results.

The force exerted by the combustion of gunpowder depends entirely upon the substances produced by the combustion. In the first place the amount of heat generated would vary with the completeness of the combustion and the nature of the resulting products. And then the effect of a given quantity of heat in the work of expansion would vary with the substances upon which it was exerted. As these substances vary so greatly with the conditions under which the powder is burned, it is not strange that a corresponding variation should be discovered in the effects produced. The length, form, and specific

gravity of the shot, the amount of windage, the caliber of the gun, the rifling of the bore, the size of the powder grains, and all of the other conditions, even the temperature of the atmosphere, may influence the chemical changes in the combustion of the powder, and thus vary the force of the shot.

CAST-IRON BOILERS.

The plan of boiler or steam generator recently introduced in England by Mr. Joseph Harrison, formerly, but not now we believe, of Philadelphia, seems to meet with decided favor among the mechanical portion of the community. The *Mechanics' Magazine* endorses its good qualities, and it is elsewhere commended. The boiler, in plan, is simply a series of cast-iron bomb-shells, such at least in form, about eight inches in diameter by three-eighths of an inch thick. These shells are all strung on a bolt like beads, and the necks, where the bolts pass through, are three inches in diameter. Four shells are cast in one piece, connected by the necks of course. Each section, therefore, has eight openings, the edges of the outside shell being faced so as to have a true bearing on the others, and otherwise fitted so as to be steam-tight. All the castings, of any number required, are then bolted together by 1¼-inch bolts. Each section of four shells may be considered a separate boiler. The heat surrounds the lower spheres, and completely envelopes them, so that they are all fire surface. In the upper shells there are fire-brick screens so placed as to moderate the heat on those parts. The shells weigh 22½ pounds each, or about one hundred of them to the tun, and the boilers are rated by weight, as "4-tun boiler," etc. Each shell holds seven pints of water, and in round numbers presents one square foot of heating surface, and holds one gallon of water.

A series of experiments made to test the strength of an individual shell showed them to be capable of resisting a pressure of five hundred pounds per square inch. These shells have also been heated seven times to a bright cherry red and plunged into cold water, but were not injured in any way. Any apprehension from the shells cracking is therefore removed, when they are made of iron similar to those with which these experiments were conducted.

Another very great virtue in this boiler is its freedom from scales. It is stated that after a long period it was found absolutely free from incrustation. This was an unlooked-for advantage, and one which adds greatly to its efficiency. If all the results claimed are obtained, this boiler seems to be a most valuable addition to engineering science. Immunity from disastrous explosion is promised, for as but one of the spheres or shells is likely to explode at once, the injury is likely to be confined to that one, and the immense strength of the shell is almost an insurance against a disaster of the kind mentioned. We shall look for further accounts of this steam generator with great interest.

ONE THING TO MAKE FOR THE SANITARY COMMISSION.

The most dangerous of all forms of malarious disease is chronic diarrhea. Though the *materia medica* has been exhausted in experiments upon thousands of patients, no drug has yet been found that will baffle the persistence of this wasting complaint. There is one simple application, however, that has proved so beneficial in the English army in India, that, it is stated, the surgeons have directed its use by all of the soldiers. It is merely a piece of flannel worn over the bowels next the skin. None but those who have tried this can form any idea of the relief which it produces. The dull pain and weakening sensation in the bowels vanish as if by magic. And the remedy, simple as it is, has been found the most efficient of any means that have yet been tried for the cure of the disease. The piece of flannel should be about a foot square, with a tape sewed across one edge, the ends extending a sufficient length to reach round the waist of the patient. It is not only good as a remedy, but is a most efficient preventive, and should be worn by all soldiers who are located in malarious regions.

At the time of the great fair in Brooklyn in aid of the Sanitary Commission, Dr. Bellows, the President of the Commission, expressed some apprehension that the fairs would have an unfavorable influence upon the contributions. He said that up to that time the receipts of the Commission had amounted, in round numbers, to eight millions of dollars, of which about one million was money, and seven millions were goods. The danger was that the reports of the large receipts at the fairs might check those gifts of stockings, mittens, blankets, preserves, etc., which were coming in from so many millions of sources all over the country as to constitute the great aggregate of the Commission's receipts. We understand that the apprehensions of the President have been realized, that there has been a large falling off in those contributions in kind which have proved so great a blessing to our brothers in the army. We know that it is only necessary to make this fact known.

NOT IN ANGER.

The London *Engineer* commences a leading editorial with the remarks, "It is years since the guns of an English ship of war have been fired in anger." Considering the facts, this remark is amusing. Ever since cannon were invented there has been an almost constant roar of English guns in every quarter of the globe. During the present administration of Lord Palmerston, England has had wars with Russia, India, China, Japan, Persia and New Zealand, besides quarrels with nearly all other nations.

The truth is, the nobility which rules the great, brave, rich, and powerful English people with such infinite condescension, is marked by the same greed for themselves, and the same desire to depress and hold down all others, including the non-noble class of their own people as well as the inhabitants of other countries, that has always characterized privileged classes, from those of ancient Sparta to those of Bourbon France. That the ruling class in England looks with an evil eye on the prosperity and growth of other nations is proved by the repeated avowal of this spirit in their public organs. Though their conquests have extended their own empire over more than seven millions of square miles, they exhibited their petty jealousy before all the world when France acquired the little district of Savoy. Though one of their colonies, Australia, is equal in extent to the States and Territories of this Union, they have openly published their policy of obstructing our growth, and manifested unbounded satisfaction at the prospect of our going to pieces.

Is the *Engineer* ignorant of the fact that England is engaged in war at the present time? And no "years" have elapsed since the enactment of that indescribable horror, the bombardment of Kagasima. Perhaps when the English guns are used to batter down the peaceful development of some harmless people, they are not fired in anger, but in a spirit of Christian kindness and brotherly love.

INSECURITY OF LIFE IN ENGLISH CARS.

English society is just now greatly excited by a shocking murder which occurred in a railway carriage. A stout well-dressed gentleman, moving in good society, took passage in a train for London; when the train arrived, public attention was called to the condition of one of the coaches which was found to be literally dripping with gore, and presenting other evidences of a terrific struggle. On further search being made the gentleman previously alluded to was found some distance up the line of road at the point of death, of course unable to give any account of what had transpired between him and his assailant.

The incident is shocking enough; but what else could be expected from the signal folly of confining strangers in close compartments on railway trains, where they are wholly cut off from communication or assistance should occasion require it. If this were the first disaster of the kind it would still be sufficiently revolting, but these crimes are of common occurrence, and a railway passenger in England is at the mercy of any ruffian who thinks it will pay to buy a first-class ticket. Cases of indecent assaults on females are continually occurring in these coaches, and stolid John Bull reads and wonders, but never takes one step toward reforming the abuse. Nor will he, until some scion of nobility is robbed and murdered, then it is possible that a new order of things will be instituted. It is almost incredible that with daily evidence of the unfitness of such vehicles for the transportation of persons entirely unknown to each other, the English should tolerate them another week. In this country public opinion and the press, and possibly something more material, would run them off the track and out of use in a short time.

THE DEFENSE OF NEW YORK HARBOR.

On the 12th of January last the General Assembly of this State adopted a resolution calling for the report of three commissioners appointed the winter before to provide for the defense of this harbor, and a copy of the report is now on our table. The Commissioners appointed were the Governor, the Comptroller, and Hon. Edwin D. Morgan. They state that they made a thorough examination of the forts constructed for the defense of the harbor, and their examination "showed that everything which seemed to be necessary in the way of fortifications and effective armaments was being supplied by the United States. A large force was being employed upon the unfinished works, and guns of the heaviest caliber were being mounted." Still the Commissioners express the opinion without reserve that these fortifications are entirely inadequate to prevent the entrance of a fleet of iron-clad ships into the harbor, and the consequent destruction of the city.

After consultation with Colonel Delafield, the engineer in charge of the defensive works around the harbor, and other able and intelligent engineers of the United States army, and after full consideration of the question, the Commissioners came to the conclusion that the only practicable plan for perfecting the defenses is that which has been so long and so persistently urged in the columns of the SCIENTIFIC AMERICAN, the anchoring of a line of heavy rafts between the forts. The Commissioners accordingly advertised for plans for such obstructions, offering $300, for the best plan, $200 for the second best, and $100 for the third best, and they employed an engineer, Mr. W. W. Evans, to take charge of the work. On inviting bids for the contract, however, it was found that the cost would be above the million of dollars appropriated by the Legislature, and the work could not be proceeded with.

From the report of Mr. Evans we make a few extracts:—

"The plan is arranged for floats 120 feet long, 50 feet wide, and six feet deep, placed 20 feet apart in the clear. The floats will weigh about 220 tuns each; their inertia will be great, and with their vertical square ends of 200 square feet of surface, their resistance to being pushed through water will be great also, as will be the resistance of the anchors and chain cables. So visibly great at first sight is their power to resist the momentum of ships moving through water, that every naval officer who has examined the plan, has at once said he would not run his ship against such a structure. Admiral Farragut said he did not believe any officer would be foolish enough to attempt it. The only good objection to be offered to the floats, as designed, is their cost. I would propose a line of smaller floats, placed at greater distances apart, as a matter of economy and greater certainty in passing flows of ice in winter. The dimensions to be 100 feet long, 30 feet wide, and six feet deep (built solid, with heavy timbers placed in longitudinal, transverse and diagonal courses, tree-nailed and screw-bolted together, as in the first design, covered with two-inch oak plank, and sheathed with spruce boards), placed 30 feet apart in the clear, anchored by two anchors up stream, and two down stream to each float; anchors and chain cables to be of the size and dimensions proposed for the former plan.

"To make this barrier more complete, and a matter to be treated with great respect by an enemy thinking or wishing to attack it, I would recommend a line of torpedoes to be placed in front of the booms, so arranged and numbered in connection with the floats they are in front of, that any one of them can be fired at the required moment from the forts, by electric action. The knowledge of the existence of such things in a navigable channel, if they are effective or not, will deter all officers but a very few of the most daring character, from attempting its passage. It is the supposed or real existence of things of this character—things that cannot be seen or weighed, or estimated with accuracy—that has much

to do with the failure to take Charleston, ever since the fleet first attempted it; at least this is the opinion of a naval officer of high rank, who stands second to none in the service of this country. He goes further, and says he believes the rebel reports of constructions in Charleston harbor to be a great bugbear; that there are none of importance—that is, unseen, submerged obstructions, and that he would so treat the matter in case he was there in command."

If both the national and State governments delay action in this matter, would it not be well for the city government to take it in hand and carry it promptly through? Local governments are always most efficient, especially for local purposes. The estimates range from $1,500,000 to $4,000,000; and it is thought that the neighborhood of the lower sum would be sufficient.

Donald McKay and the Light-draught Monitors.

The following interesting letter from Mr. Donald McKay, the well-known shipbuilder, appears in the Boston *Advertiser:*—

"Having seen an article copied into one of our Boston papers from a New York journal, to the effect that there had been some disagreement between the contractors of the new light-draught monitors and the Navy Department, I deem it a duty to all concerned to state the facts for the information of the public.

"I attended all the meetings of the contractors recently held in New York, and can say that the utmost harmony prevailed. We were fairly met by the officers appointed by the Government on all questions. In relation to the paymants for back work and future improvements, there was no disposition manifested to deprive us of a single dollar; on the contary, we have reason to believe that all our payments will be promptly approved, as those already earned according to the terms of the contract have been.

"In relation to the monitors, the Department has delegated Captain Ericsson to make such improvement in them as will render them available for coast and harbor defence, and when we consider their light draught for these purposes, they will be very efficient against any foreign force. It is well known that all the foreign iron-clads are very deep, and would not therefore approach our monitors, which could be moored in shallow water, or kept under steam, as circumstances might require. The superiority of the their artillery has been tested in the contest between the *Kearsarge* and the *Alabama*. As they are in various stages of advancement, some of them not nearly completed, the expense of the contemplated improvements will not be so great as the public has been led to suppose. Captain Ericsson, who, with others, has the matter in charge, is well known to the scientific world, and does not, therefore, require my endorsement; but this much I may say, that his construction of the first monitor saved the nation from a great humiliation. I have examined the *Dictator* and *Puritan*, which he has designed and superintended, and consider that in material, workmanship, and invulnerability they excel anything which I have seen in England or France.

"I am well aware that the public has been quite restless in relation to the movements of the Navy Department on account of the depredations of the *Alabama*, *Florida*, and *Georgia;* but if the facts were generally known they would show that the power of these vessels has been greatly exaggerated. In a letter to Senator Grimes, which you published a short time since, I boldly asserted that the *Alabama* was inferior in speed and fighting qualities to our sloops of war—the truth of which was clearly demonstrated in the recent glorious naval combat! The difficulty has not been a want of vessels of the right class to destroy these British rovers, but to obtain sight of them. It is my deliberate opinion that almost any of our sloops could easily overhaul the *Florida* in a twelve hours' run, and bring her to action. The accounts of her great speed, from the size of the vessel and her well-known motive power, are entirely incorrect. I do not believe she can be driven more than twelve knots an hour under steam alone for more than two or three hours at a time. If the public will only exercise a little patience they will find that the Navy Department has not neglected its duty in this hour of our national struggle, and that in the designs of even the light-draught monitors it has acted with more skill than many have believed. These vessels were a bold experiment—an innovation upon all previous notions of iron-clads, and could not be expected to be wholly perfect at first, but I am confident that without change from the first design they would be most valuable for home defence. To make them available for action in Southern waters, in all weather, the proposed improvement is necessary.

"In addition I would earnestly recommend the construction of a number of sea-going wooden ships, heavily iron-clad, with high speed, from twenty-four to thirty-six guns—and thus secure the respect of all the other nations of the world, and the best guarantee of impartial neutrality."

THE HECKER AND WATERMAN EXPERIMENTS.

We give this week the results of four experiments of 30 hours, each made between April 1st and April 26th, the engine being worked as a non-condenser. The following are the figures:—

Total number of revolutions of the engine during each 30-hours run—

⅞ths cut-off	110,612
¾ds cut-off	110,612
⅝ cut-off	110,499
½th cut-off	70,426

Total number of the revolutions of the fan—

⅞ths cut-off	110,612
¾ds cut-off	110,612
⅝ cut-off	110,499
½th cut-off	111,710

Total number of pounds of water evaporated—

⅞ths cut-off	15,571
¾ds cut-off	13,0·6
⅝ cut-off	12,606
½th cut-off	10,394

Total number of pounds of steam condensed in the steam jacket—

⅞ths cut-off	417·5
¾ds cut-off	515·5
⅝ cut-off	511
½th cut-off	433·75

Total number of pounds of combustible consumed, adding coal and wood together and deducting the ashes—

⅞ths cut-off	1,508
¾ds cut-off	1,328
⅝ cut-off	1,294
½th cut-off	1,061·25

Number of revolutions of engine per minute—

⅞ths cut-off	61·451
¾ds cut-off	61·324
⅝ cut-off	61·388
½th cut-off	39·125

Number of revolutions of fan per minute—

⅞ths cut-off	61·451
¾ds cut-off	61·324
⅝ cut-off	61·388
½th cut-off	62·000

Mean hight of barometer during each run—

⅞ths cut-off	29·69
¾ds cut-off	30·04
⅝ cut-off	30·13
½ths cut-off	29·88

Mean temperature of feed-water—

⅞ths cut-off	43
¾ds cut-off	43
⅝ cut-off	43
½th cut-off	51

Mean temperature of engine-room—

⅞ths cut-off	74·93
¾ds cut-off	70·71
⅝ cut-off	75·47
½th cut-off	75·45

Mean steam-pressure in boiler per gage—

⅞ths cut-off	45·80
¾ds cut-off	47·25
⅝ cut-off	45·78
½th cut-off	48·61

Mean pressure in cylinder above full vacuum at beginning of stroke—

⅞ths cut-off	35·462
¾ds cut-off	45·866
⅝ cut-off	45·166
½th cut-off	46·611

Mean pressure at point of cut-off—

⅞ths cut-off	27·6
¾ds cut-off	00·736
⅝ cut-off	40·386
½th cut-off	51·943

Mean pressure at end of stroke—

⅞ths cut-off	31·319
¾ds cut-off	17·276
⅝ cut-off	17·280
½th cut-off	21·261

Mean back pressure on piston—

⅞ths cut-off	15·825
¾ds cut-off	15·741
⅝ cut-off	15·150
½th cut-off	16·000

Mean gross effective pressure—

⅞ths cut-off	15·144
¾ds cut-off	15·986
⅝ cut-off	15·150
½th cut-off	21·300

Gross effective horse-power per indicator—

⅞ths cut-off	8·878
¾ds cut-off	9·230
⅝ cut-off	8·926
½th cut-off	8·068

Total horse-power, including overcoming back pressure—

⅞ths cut-off	18·232
¾ds cut-off	18·911
⅝ cut-off	17·841
½th cut-off	14·062

Net horse-power applied to fan, deducting back pressure and friction of engine—

⅞ths cut-off	7·145
¾ds cut-off	6·986
⅝ cut-off	7·112
½th cut-off	6·934

Pounds of feed-water per hour per total horse-power per indicator—

⅞ths cut-off	38·460
¾ds cut-off	47·161
⅝ cut-off	47·066
½th cut-off	41·399

Pounds of combustible per total indicated horse-power per hour—

⅞ths cut-off	2·788
¾ds cut-off	2·834
⅝ cut-off	2·879
½th cut-off	2·909

It will be observed that in these four experiments the engine was run as a non-condenser, hence the high back-pressure as compared with the other experiments. The figures give the total back pressure, including that of the escaping steam added to that of the atmosphere. It will be observed that in the first three runs of 30 hours each, the number of revolutions of the fan were the same as those of the engine, while in the last run the fan made a much larger number of revolutions than the engine. In the first three runs the fan shaft was coupled directly to the engine shaft, but before the last run was commenced gearing was introduced to give a slower motion to the engine for the same work. The piston speed being reduced, a higher mean pressure was required, as will be seen by the figures. The work at the ½th cut-off was a little higher than in the other cases, but allowance was of course made for this in the calculations—not in the observations.

Profits of City Railroads.

From the elaborate table of the *American Railroad Journal* we take the statement of dividends on the paid-up capital of the following city railroads:—

Broadway, Boston	9½ per cent.
Cambridge, Boston	9 "
Metropolitan, Boston	10 "
Brooklyn City	9 "
Eighth Avenue, New York	12 "
Sixth Avenue, New York	10 "
Third Avenue, New York	12 "
Green and Coates street, Philadelphia	19½ "
Second and Third street, Philadelphia	36 "
Citizens', Pittsburgh	20 "

A NEW alloy, described as applicable to the manufacture of all metal articles, bells, hammers, anvils, rails, and non-cutting tools, has been patented by Mr. M. H. Micolon, of Paris. The alloy consists of iron with manganese or borax. The patentee takes twenty parts of iron turnings or tin waste, eighty parts of steel, four parts of manganese, and four parts of borax; but these proportions may be varied. When it is desired to increase the tenacity of the alloy, two or three parts of wolfram are added. When the cupola is ready, the iron and steel are poured in, and then the manganese and borax; finally, the vessel is filled up with coke; the metal is thus in direct contact with the fuel in the cupola, and by quickly running the fused mass into molds, bells which possess the sonority of silver, whilst the cost is less than bronze, may be obtained.

COST OF FUEL ON LOCOMOTIVES.—From the report of the New Haven Railroad Company, as published in the *American Railroad Journal*, we extract the following:

"The number of miles run by passenger trains during the year, was 465,617; by freight trains, 104,308; by service trains, 485—total, 570,410.

The cost of fuel for running the trains the past year has been $116,873 36 or about 20½ cents per wile, against 14½ cents for the preceeding year. Tuns of coal used, 10,729; cords of wood, 1,017; cords of kindlings, 1,030."

AMONG some discoveries recently made at Pompeii, one of the most curious is a well in which excellent water exists. Up to the moment of making this discovery, no well had ever been met with at Pompei containing water. M. de Luca has undertaken its analysis.

THE prize of 50,000 francs offered by the Emperor Napoleon for the most useful application of electricity has at length been awarded to M. Ruhmkorff for his induction coil. The King of Hanover, having heard of the award, has forwarded to M. Ruhmkorff a large gold medel *pour le merite.*

PERFUMERY.

We recently noticed the publication by Henry Carey Baird, of Philadelphia, of Pradal's great work on perfumery, translated by Prof. H. Dusauce. We give herewith from this standard work a few receipts for making the most popular colognes, toilet vinegars, and sachets:—

EAUX DE COLOGNE.

Eau de Cologne de J. M. Farine.—Take alcohol at 85°, 100 quarts; essence of bergamot, 12½ lbs.; essence of lemon, 6 lbs. 3 ounces; essence of neroli, 26½ ounces; essence of clove, 3 lbs. 3 ounces; essence of lavender, 2 lbs. 5 ounces; essence of rosemary, 26½ ounces; macerate thirty days, and filter.

Eau de Cologne M. de Marie.—Take alcohol at 85°, 30 quarts; water, 15 quarts; essence of bergamot, 12½ ounces; essence of cedrat, 2 ounces; essence of lemon, 2 ounces; essence of Portugal, 2 ounces; essence of neroli, 2 ounces; essence of rosemary, ½ ounce; essence of clove, 2 drs.; tincture of benzoin, 4 ounces; holy thistle, 1 ounce; citronella, 1 ounce; herb of peppermint, 2 ounces; herb of melisse, 2 ounces; herb of rosemary, 1 ounce; herb of angelica, 3 ounces; mace, 2 drs.; badiane, 8 ounces; canella, 2 drs. Infuse the whole two days, distil, and extract thirty-five quarts of eau de cologne.

TOILET VINEGARS.

The best vinegar should be used for these articles; that which is called white wine vinegar, made by acetification or oxidation of alcohol, is the best.

These vinegars are perfumed and made in two ways, by distillation or infusion. However, distillation is the best mode, for whilst increasing the strength of vinegar, it whitens it.

They are also prepared by solution, *i. e.*, by dissolving for example, 1 ounce of essential oil in a sufficient quantity of alcohol, and adding it to a quart of vinegar. This is the easiest and most speedy mode of preparing all the kinds of vinegars.

Vinaigre Rosat.—Take dry rose leaves, red, ½ lb.; good vinegar, 8 quarts. Macerate two weeks, and filter.

Vinaigre à la Fleur d'Oranger.—Take fresh orange flowers, 1½ lb.; vinegar, 8 quarts; brandy à la fleur d'oranger, 1 quart. Macerate twelve days, and filter.

Vinaigre Framboisé.—Take crushed fresh raspberries, 6 lbs.; good vinegar, 1 quart. Macerate one week, strain, and after a few days filter.

SACHETS.

These articles—for some time heretofore out of use—are again in fashion. The sachet consists of a small muslin bag, inclosing fragrant powders, with an elegant outer covering or envelope of silk or satin, of color in every variety, and ornamented with devices suitable to the taste of the customer. They are used for perfuming wardrobes and clothes-chests.

In speaking of powders, those which are particularly adapted to sachets were mentioned, but generally the body of most all of the odorous powders is applicable.

1. *Sachet Powder.*—Orris root, 4 ounces; calamus, 2 ounces; yellow saunders, 4 drs.; cloves, 2 drs.; benzoin, 4 drs.; dry bergamot, 1 ounce. Reduce to fine powder, and mix thoroughly.

2. *Sachet Powder.*—Dried rose leaves, 8 ounces; cloves, 4 drs.; nutmegs, 4 drs.

Sachet au Bouquet des Graces.—Orris root, 6 ounces; dry orange flowers, dry rose leaves, 6 ounces; dry bergamot peel and Portugal, orange peel, 6 ounces; storax, 2 ounces. Powder well, sieve, and with the powder fill the sachets.

Photographic Ghosts.

Photographers are acquainted with three or four different ways in which secondary images may appear in photographs. In the first place, when a sensitive glass plate has served its turn as a negative—as many paper positives as may be needed having been taken from it—the film of collodion or other prepared surface is removed from it, and it may then be used for a wholly new photograph. But it is found that, unless great care be used, some faint traces of the former picture still remain, and these may appear as a sort of ghostly attendant upon the figure forming the second picture. One photographer, in endeavoring to utilize an old plate which had fulfilled its duty as a negative of the late Prince Consort, could not wholly erase the image, wash or rub as he might; there was always a faint ghost of the prince accompanying any subsequent photograph taken on the same plate. Dr. Phipson relates that a friend of his received at Brussels a box of glass plates, quite new and highly polished, each wrapped in a piece of the *Independance Belge* newspaper; a lady sat for her photograph, taken on one of these plates, and both the photographers and the lady were astonished to see that her likeness was covered with printed charters, easily to be read—the ghost of a political article in fact. In this case, actinic rays had done their work before the glass was exposed to the camera. By another mode of manipulation, a photographer may produce a ghost-like effect at pleasure: a sitter is allowed to remain in the focus of the camera only half the time necessary to produce a complete photograph; he slips quickly aside, and the furniture immediately behind him is then exposed to the action of the light; as a consequence, a faint or imperfectly developed photograph of the man appears, transparent or translucent, for the furniture is visible apparently through his body or head. With a little tact, a really surprising effect may be produced in this way. As a third variety, one negative may be placed in contact with another, and a particular kind of light allowed to pass through it for a time; there results a double picture on the lower negative, one fainter than the other. It is known, moreover, to the more scientific class of photographers, that if the lens in the camera is imperfectly curved at the surfaces, spots of cloudy light may appear in the photograph, having a semi-ghostly sort of effect.

SPECIAL NOTICES.

FOWLER M. RAY, executor of F. M. Ray, deceased, of New York City, has petitioned for the extension of a patent granted to him on Oct. 8, 1850, for an improvement in vulcanized india-rubber springs.

It is ordered that the said petition be heard at the Patent Office, Washington, on Monday, Sept. 19, 1864.

ALLEN B. WILSON, of Waterbury, Conn., has petitioned for the extension of a patent granted to him on Nov. 12, 1850, and re-issued in two divisions, Nos. 345 and 346, Jan. 22, 1856, and division No. 345 surrendered and again re-issued Dec. 9, 1856, numbered 414, and he now prays for the extension of the re-issue numbered 414, for an improvement in sewing machines.

It is ordered that the said petition be heard at the Patent Office, Washington, on Monday, Oct. 24, 1864.

LEWIS C. ENGLAND, formerly of Williamsburgh, N. Y., and now of Wellsville, N. Y., has petitioned for the extension of a patent granted to him on Dec. 24, 1850, for an improvement in vats for tanning hides.

It is ordered that the said petition be heard at the Patent Office, Washington, on Monday, Dec. 5, 1864.

NEWELL WYLLYS, of South Glastenbury, Conn., has petitioned for the extension of a patent granted to him on Jan. 28, 1851, for an improvement in drawing regulators for spinning machines.

It is ordered that the said petition be heard at the Patent Office, Washington, on Monday, Dec. 26, 1864.

All persons interested are required to appear and show cause why said petitions should not be granted. Persons opposing the extensions are required to file their testimony in writing, at least twenty days before the final hearing.

TO OUR READERS.

PATENT CLAIMS.—Persons desiring the claim of any invention which has been patented within thirty years, can obtain a copy by addressing a note to this office, stating the name of the patentee and date of patent, when known, and enclosing $1 as fee for copying. We can also furnish a sketch of any patented machine issued since 1853, to accompany the claim, on receipt of $2. Address MUNN & CO., Patent Solicitors, No. 37 Park Row, New York.

INVARIABLE RULE.—It is an established rule of this office to stop sending the paper when the time for which it was pre-paid has expired.

MODELS are required to accompany applications for Patents under the new law, the same as formerly, except on design patents, when two good drawings are all that are required to accompany the petition, specification and oath, except the Government fee.

RECEIPTS.—When money is paid at the office for subscriptions, a receipt for it will always be given; but when subscribers remit their money by mail, they may consider the arrival of the first paper a *bona-fide* acknowledgement of our reception of their funds.

ISSUED FROM THE UNITED STATES PATENT-OFFICE

FOR THE WEEK ENDING JULY 26, 1864.

Reported Officially for the Scientific American.

☞ Pamphlets containing the Patent Laws and full particulars of the mode of applying for Letters Patent, specifying size of model required and much other information useful to inventors, may be had gratis by addressing MUNN & CO., Publishers of the SCIENTIFIC AMERICAN, New York.

43,631.—Adjusting Pattern for Boots, &c.—Francis E. Augustine, Dubuque, Iowa:

I claim, first, A sectional pattern for boots, shoes, etc., so constructed and put together that all the sections can be adjusted simultaneously, by means substantially as herein described.

Second, Adjusting the sections of an expanding and contracting pattern by means of the racks and pinion, applied and operating substantially as described.

Third, The racks, d, pinion, g, pinion-staff, h, and jam nut, n, all combined with the adjustable sections, and operating substantially as described.

43,632.—Churn.—Leonard Bacon, Charlotte, Mich.:

I claim the specific arrangement of reciprocating dashers, with the fingers, h h h', and i i i', in combination with the case, A, guides, b b, arms, c c, rolls, a a, pivoted to the arms, and double crank, D, when operating conjointly in the manner and for the purpose set forth.

43,633.—Magnetic Annunciator.—John Blackie, Washington, D. C.:

I claim, first, Operating an eccentrically-hung keeper or armature, A, by means of a series of magnets, substantially as herein set forth.

Second, I claim the stop, l, in combination with the spring, h, or its equivalent, for the purpose of holding the keeper, A, and index, a, in position.

Third, I claim operating the catch, h, and hammer, f, by the keeper, I, substantially as described.

Fourth, I claim the connecting coils, and series of plates, 1st 2d, etc., in combination with a differential galvanometer, as shown and described.

Fifth, I claim the wheel, o, mounted in the adjustable frame, p operated by the spring arm, O, and shaft, N, in combination with the series of plates, 1st 2d, etc., as described.

Sixth, I also claim connecting an operating shaft, N, with the rudder post, M, by means of the slotted arm, n', arm, m, and pin, l', by which means the vertical movement of the rudder post is prevented from disarranging or interfering with the post, N, and its attachments.

43,634.—Gage for Shears.—Charles' Brembacher, New York City:

I claim the handle rack and pinion, or similar mechanism that actuates the gage, when said handle is contiguous to the handle of the shears, substantially as and for the purposes specified.

43,635.—Cultivator.—James Canfield, Sabula, Iowa:

I claim the combination and arrangement of the axle, E E, the bow, D, plow beams, H F, cross-pieces, R, and bow, I, the removable bar, J, draught pole, A, bar, B, standards, C, pivot, x, and seat, O, all constructed, arranged and operating substantially as and for the purposes specified.

43,636.—Knitting Machine Burr.—W. H. Carr, Troy, N. Y.:

I claim, first, A knitting burr-blade, A, having on its inner end a dove-tail or flaring projection, b, and lateral shoulders, c c, substantially as herein described.

I also claim a knitting-burr hub composed of two rings, D D', slotted and secured together end to end, and having an outwardly narrowed annular space, h, formed by and between the inner ends of the said united hub-rings, substantially as herein described.

And I also claim the combination of a series of wings or blades, A, each having a dove-tail or flaring projection, b, and shoulders, c c, on its inner end, with a hub composed of two rings, D D', slotted and clamped together end to end, and having an outwardly-narrowed, annular recess, h, formed by and between the inner ends of the said united hub-rings, substantially as herein described.

43,637.—Double-acting Hollow Piston Pump.—Francis A. Chase, Jordan, N. Y.:

I claim, first, The arrangement consisting of the three chambered cylinder or case, hollow piston rod, double acting piston and double acting oscillating supply valve, substantially in the manner and for the purpose described.

Second, Connecting the piston valves directly to the hollow piston rod by means of separated legs, k k, substantially as described.

Third, The double beveled ring, J, working between two beveled disks, G G', applied to the piston rod, F, substantially as and for the purposes described.

Fourth, The combination of the metallic wing valve, E, double acting piston valve, ring piston, and hollow piston rod, with a three-chambered pump, substantially as described.

Fifth, The detachable part box, D, valve, E, and division, a, in combination with side passages or ports, C C', constructed substantially as and for the purpose described.

43,638.—Pick.—John D. Cochran, Kern River, Cal.:

I claim a pick constructed as described, substantially as and for the purpose specified.

43,639.—Fertilizer.—Wm. H. H. Glover.—New York City:

I claim the combination of the muck or its equivalent with refuse water, gurry, etc., substantially as and for the purposes set forth, by which I am enabled to save and fix in a mechanical form the fertilizing properties contained therein that would otherwise run to waste.

43,640.—Coupling for Carriages.—Chauncey H. Guard, Troy, N. Y.:

I claim, first, The combination of the clip, B, ball, E, and segments, F F, in such manner that the said ball and segments shall perform the functions of the "turning circle" of the vehicle whilst the said segments afford a seat for the reception of the spring, G.

Second, Combining the segments, F F, spring, G, and forked brace, H, with each other by means of the bolts, c c, and e e, formed and arranged as herein represented and described.

43,641.—Device for starting Sewing Machines, etc.—James Herron, Washington, D. C.:

I claim, first, The combination of the pedal, p p, the rod, r r, and the hook, v, or their equivalents, constructed and operating substantially as and for the purpose shown and set forth.

Second, The circle of teeth, z, constructed as described, and used in connection with the rod, r r, and its hook, v.

Third, The combination of the cam slot, S, or its equivalent, and the rod, r, as and for the purpose shown and described.

Fourth, The combination of the pedal, p p, the rod, r r, the hook, v, the teeth, z, and the cam slot, S, in the manner and for the purpose set forth.

43,642.—Rotary Engine.—D. L. Jaques, Hudson, Mich.:

I claim, first, The piston-heads, P P, constructed and operating substantially as set forth.

Second, The semi-circular valves, S S, constructed and operating substantially as specified.

Third, The combination and arrangement of the steam-chest, C

throttle valve, f, and governor valve, g, constructed and operating substantially in the manner, and for the purpose specified.

43,643.—Halter holder.—George F. Jerome, Hempstead, N. Y.:

I claim, first, A halter-holder formed of the weighted chain or rope over a pulley or block and provided with a hitching and stop ring or its equivalent, to determine the amount said halter is taken up and thereby relieve the animal's head from the weight, as specified.

Second, I claim the movable bar or stop, k, in combination with the halter-holder, d, to determine the range allowed to the animal, as specified.

Third, I claim the combination of the halter-holder, d, weight, g, and inclosing case, i, for the purposes and as specified.

Fourth, I claim the weight-box, g, fitted to contain more or less weight, in combination with the halter-holder, d, for the purposes and as specified.

43,644.—Corrugated Fence Picket (sheet-metal corrugated).—B. F. Miller, New York City:

I claim a corrugated sheet metal picket for a fence as a new article of manufacture.

43,645.—Blacking-box Holder.—John H. Rector and Alvah Sweetland, Syracuse, N. Y.:

We claim the improved blacking-box adapting the wheel, F, increase slot, G, slide, D, pivot, H, hook, E, combined with each other and operating substantially as herein set forth.

43,646.—Machine for Concentrating the Dust of Ores, Mills, etc.—Samuel H. Rounds and Walter L. Strong, San Francisco, Cal.:

We calim a machine for concentrating ore dust, with a sufficient condensing surface for the purpose and in the manner substantially as described and set forth.

43,647.—Cleaning Wool.—Frederic M. Ruschhaupt and Geo. Perzel, New York City. Ante-dated April 29, 1864:

We claim subjecting the raw wool to a chemical process, as herein described and for the purpose set forth.

43,648.—Making Printers' Types.—John Jos. Chas. Smith, Philadelphia, Pa. Ante-dated July 19, 1864:

Iclaim the manfacturing of printing type by first casting single strips of metal, such as above described, and then cutting up the strips into single type, substantially as set forth.

43,649.—Machine for cutting Printers' Types.—John Jos. Chas. Smith, Philadelphia, Pa.:

I claim, first, the carriage, A, and saw, B, arranged and operated substantilly as above described, whereby the type strips can be approximated to and removed from the saw at each successive cut.

Second, The gripping jaw, P, to be operated by hand for holding the type securely in place, during the operation of cutting, in the manner described.

Third, The movable gage-bar, N, for adjusting type of any size to the cutting aparatus by gaging the types between the heads, before they are cut from the strip.

Fourth, The channel, O, and the sliding-block, S, for receiving and supporting the type after they are cut off, so that they can be removed while set up, in a composed condition.

Fifth, The hooked feeding-bar, H, arranged and operating as described, for the purpose of feeding a series of strips of type to the cutter and at the same time holding them down to the surface of the carriage, so as to secure a square cut.

43,650.—Horse-shoe.—Alexander Tyrrel, Batavia, N. N.:

I claim making a horse shoe with shoulders or projections upon the upper side of the rear ends, and making the same narrower at the toe than the other parts of the shoe, substantially as and for the purposes described.

43,651.—Carriage Wheel.—Geo. B. Woodard, Bolivar, N. Y., and A. B. Woodard, Alfred Center, N. Y.:

We claim the combination in a suspension-carriage-wheel, of the thimble nuts, E, and the small nuts, F, with the spokes or tension-rods, C, and the hub, D, substantially as and for the purpose set forth.

43,652.—Oil-can and Powder Canister.—Edmund W. Woodruff, Washington, D. C:

I claim the arrangement of a canister for containing cleaning or polishing material, in combination with an oil-can and oiler, in the manner herein specified, and for the purposes set forth.

43,653—Spark-arrester.—Rapha Woodworth, Underhill, Vt.:

I claim the construction and application to steam engines, of a smoke-stack, consisting of a smoke pipe-reservoir for cinders, steam chamber and cap, so arranged (as herein described) that the sparks are brought in contact with steam by which they are extinguished before passing from the smoke-stack.

43,654.—Hemp-brake.—Thomas L. Fortune, of Weston, Mo., assignor to himself and George T. Challiss, Atchison, Kansas.

I claim, first, a hemp brake operated by a wagon, substantially in the manner and for the purposel set forth.

Second, The peculiar arrangement of the cogged arms, c, in connection with the shafts, a and b, substantially as described.

Third, I claim the use of the upper beater, K, when rocked back and forth against the upper beater or beaters, substantially in the manner and for the purposes set forth.

Fourth, The use of the hinged upper beaters so arranged as to yield to the force of the under beater when the stroke of the latter is sufficient to lift or swing up the upper beaters, substantially as set forth.

43,655.—Breech-loading Ordnance.—Thomas L. Fortune, Weston, Mo., assignor to himself and George F. Challiss, Atchison, Kansas:

I claim the gate, G, in combination with the cap, B, for opening and closing the breech of a fire-arm, substantially as set forth.

43,656.—Folding Bedstead.—Joseph L. Roberts, Dorchester, Mass., assignor to Mauran & Tuck, Boston, Mass.:

I claim the combination and arrangement of the spring, h, secured within a recess of the post, A, by the rivet, i, with the side piece, B, and cleats, k, as set forth and for the purpose described.

43,657.—Hemmer for Sewing Machines.—Charles H. Willcox (assignor to James Willcox), New York City. Patented in England No. 2,958, 1861:

I claim the application and use, in combination with a hemmer or other attachment to sewing machines, of a check or adjusting plate, substantially as herein shown and described.

43,658.—Mode of hardening and repairing Files and Rasps.—Charles Adolphe Clavell, Paris, France:

I claim the combination or mixture, in the above proportions, of sulphuric and nitric acids diluted with water, and employed as above for repairing or re-cutting worn-out rasps and files, and rendering them again fit for use, and for hardening the surfaces of new files and rasps, substantially as above described.

43,659.—Water-proof Preparation. — Pierre Francois Louis Bienvaux Him, Brussels, Belgium. Patented in Belgium April 15th, 1861. Patented in England April 19th, 1863:

I claim the hydrofuge or water-proof preparation, as substantially described above.

RE-ISSUE.

1,732.—Revolving Rake.—Sylvester E. Ament, Oswego, Ill. Patented Feb. 9, 1864:

I claim, first, The metallic bearing girdle, D, adapted to be fixed upon the shaft, A, substantially in the manner and for the purpose herein set forth.

Second, I claim the flanges, 1 and 2, having the situation described, and employed for the purpose substantially as herein set forth.

Third, I claim in revolving rakes the duplicate sliding bolts, I and J, arranged relatively to one or more pairs of reversed stops, W Y, and to operate substantially as and for the purpose herein set forth.

Fourth, I claim the sectional eccentric peripheries of the flanges, 1 and 2, arranged relatively to bolts, I and J, and to the operative parts of a revolving rake, substantially as and for the purpose herein set forth.

Fifth, I claim the metallic bush or saddle, F, formed with side checks, f1 f2, and with notches or holes, f1 f2, arranged to serve in connection with the handle E, and with sliding stops, I J, substantially in the manner and for the purpose herein set forth.

Sixth, I claim bracing the entire series of teeth, by the employment of the series of braces, P P, arranged to form an additional direct connection from the rigid shaft, A, to the teeth, a, substantially in the manner and for the purpose herein set forth.

DESIGNS.

1,979.—Plates of a Cook's Stove.—Isaac Dezouche (assignor to Bridge, Beach & Co.), St. Louis, Mo.

1,980.—Plates of a Parlor Cook's Stove.—Isaac Dezouche (assignor to Bridge, Beach & Co.), St. Louis, Mo.

EXTENSIONS.

Joint for Compasses for Measuring.—Theodore Altenedер, Philadelphia, Pa. Patented July 16, 1850:

I claim a compass joint formed of two surfaces held together by center screws, passing through a cap piece, substantially as herein described.

Machine for raking and binding Grain.—John E. Heath, Warren, Ohio. Patented July 22, 1850:

I claim, first, Gathering the grain and compressing it into a sheaf, substantially as herein set forth, by means of the rake and standards.

Second, Carrying the cord round the sheaf, and holding the latter until the band is tied by means of the curved lever, h, and toothed arms, g', substantially as herein described.

Third, The employment of the split thimble and sliding hook to aid in tying the band.

Fourth, Alternating the rake to gather the grain and compress the sheaf by means of the spring, strap, and drum, substantially as herein set forth.

Fifth, Bridging the space through which the bound sheaf drops, to support the grain while it is being gathered, substantially as herein set forth.

Truss Pad.—Frederick M. Butler, New York City. Patented July 22, 1850:

I claim the formation of the pads for trusses, braces, supporters, &c., as above described, to wit, made of shape in the boundary seen at Figs. 5 and 6 (a rounded obtuse angle), and the padding made somewhat bollow and fullest on the side, A A A A, as seen in Figs. 1, 3 and 4, adapted to bear under and outwards of the fullness of the abdomen, making a plane-concave pad, whether single or double (the latter seen in Figs. 7, 8, 9, 10).

EXTENSION OF PATENTS.

Many valuable patents are annually expiring which might readily be extended, and if extended, might prove the source of wealth to their fortunate possessors. Messrs. MUNN & CO. are persuaded that very many patents ar suffered to expire without any effort at extension, owing to want of proper information on the part of the patentees, their relatives or assigns, as to the law and the mode of procedure in order to obtain a renewed grant. Some of the most valuable grants now existing are *extended patents*. Patentees, or, if deceased, their heirs, may apply for the extension of patents, but should give ninety days' notice of their intention

Patents may be extended and preliminary advice obtained, by consulting or writing to MUNN & CO., No. 37 Park Row, New York.

ASSIGNMENTS OF PATENTS.

The assignment of patents, and agreements between patentees and manufacturers, carefully prepared and placed upon the records at the Patent Office. Address MUNN & CO., at the Scientific American atent Agency, No. 37 Park Row, New York.

UNCLAIMED MODELS.

Parties sending models to this office on which they decide not to apply for Letters Patent and which they wish preserved, will please to order them returned as early as possible. We cannot engage to retain models more than one year after their receipt, owing to their vast accumulation, and our lack of st age room. Parties, therefore, who wish to preserve their models should order them returned within one year after sending them to us, to insure there obtaining them. In case an application has been made for a patent the model is in deposit at the Patent office, and cannot be withdrawn.

It would require many columns to detail all the ways in which the Inventor or Patentee may be served at our offices. We cordially invite all who have anything to do with patent property or inventions to call at our extensive offices, No. 37 Park Row, New York, where any questions regarding the rights of Patentees, will be cheerfully answered.

Communications and remittances by mail, and models by express repaid) should be addressed to MUNN & CO. No. 37 Park Row, New York.

Notes and Queries

E. D., of Ill.—The London *Mechanic's Magazine*, very good authority, says that Charles Wye Williams's work on "Combustion of Coal," contains all that is known on the subject. Our own opinion of Mr. Williams as a writer you will find distinctly expressed on page 25 of our current volume. Henry Carey Baird, of Philadelphia, publishes industrial works of all kinds.

W. F. Q., of Del.—Many efforts have been made to preserve meat and vegetables in carbonic acid and other gases which contain no free oxygen, but without success. Not long since we saw a jar of eggs opened that had been sealed up two years in gas, but they were all decayed.

S. M., of Ind.—Water is a poor conductor of heat, and you may heat that in one part of a vessel higher than the other portions, but if you stir it as to keep it mixed, you will find that no fire however hot will heat water above 32°, as long as there is a lump of ice in the water. The heat is absorbed and made latent in melting the ice.

J., of S. I.—Fortunately the postage money goes to Uncle Sam, and not to the female copperhead who you say serves your post-office.

B. W., of Mass.—A "shrinkage rule" is one used by pattern makers. It is made 24 and ⅛th inches long, and is used by them on large patterns. This makes the casting of the right length when finished as it shrinks, if of iron, ⅛th of an inch to the foot, in cooling.

R. W. M., of N. Y.—The green bronzes you see in the windows of stores are made so artificially. Bronzes steeped some days in a strong solution of common salt, if washed in water and allowed to dry slowly become permanently green. Or a strong solution of sugar with a little oxalic acid will produce the green color. A dilute solution of ammonia allowed to dry on the surface produces an evanescent green.

J. M., of Pa.—The law regards the extension of a patent as equivalent in some respects to the grant of an entirely new patent. Assignments or licenses under the old patent have no life under the extension.

J. B., of Conn.—The weight of any cast-iron ball is found by multiplying the cube of the diameter in inches by 1377 the product will be the pounds avoirdupois. To find the weight of a cast-iron ring multiply the breadth of the ring added to the inner diameter by 0074 and that again by the breadth and thickness. This will give the weight in cwts. of 112 lbs., nearly.

B. M. X., of N. Y.—You can turn box-wood as well as any other wood. If it "chips," as you say, your tools must be dull, or else you don't manage them properly.

R. P. G., of R. I.—Connecting rods are generally made three times the length of the stroke, though this is merely an arbitrary rule. Engineers make their rods of lengths to suit circumstances—short for instance in a screw engine. The length of the rod in a beam-engine is the distance between the center of the beam and the center of the main shaft.

J. P. C., of N. Y.—We should have no hesitation in saying that the steel belt would run a long time without undergoing molecular change to an injurious degree. Belt saws, essentially the same thing, are in practical use. The effect of wet is easily counteracted.

R. B. O., of Ill.—For a revolving spark to produce the impression on the eye of being a continued circle of light, it must complete a revolution in one-third of a second in a dark room, and in one-sixth of a second by daylight.

F. A. M., of Pa.—The Patent Reports are not sold by the Government but given away. Apply to your representative in Congress.

A. N., of R. I.—The color of the electric spark varies with the medium through which the charge is made. In chlorine it is green, in nitrogen blue, and in hydrogen crimson. Lightning is purple or violet.

L. D. B., of N. J.—Hilton's insoluble cement is as good as anything we know of for your purpose. Water will not injure it and it becomes as hard as stone by exposure to the air. For sale in the stores.

U. S. S. *Tensas*.—The stores are full of preparations for destroying vermin. Buy some of these articles, they will answer the purpose well.

H. H. H., of ——If you wish to add something to ordinary ink to make it indelible, we can suggest nothing better than the sulphate of indigo. That will not be as permanent, however, as the ordinary indelible ink made of nitrate of silver. If you buy Arnold's ink, or any of the blue writing fluids, you will probably have an ink with the sulphate of indigo already in. Common writing ink answers very well for marking linen.

A Reader of Conn.—Your inquiry whether if the mechanism were mathematically perfect, the piston of a steam engine on completing its upward stroke would stop before commencing its downward stroke, is one of those abstract puzzles such as had great charms for the ancient philosophers, and for the schoolmen of the middle ages, but are distasteful to the students of modern science. In practice there is no doubt that every piston does stop, as there is always sufficient imperfection in the machinery to secure this result, whatever the decision in relation to the abstract question. As we know of no conclusive demonstration on which to found a decision, perhaps you had better keep the question as a puzzle, if in the vast domain of ascertainable facts you can find no better use for your brains.

Money Received.

At the Scientific American Office, on account of Patent Office business, from Wednesday, July 20, 1864, to Wednesday, July 27, 1864:—

A. S., of N. Y., $30; N. M. J., of N. Y., $16; H. R., of Wis., $20; C. & J., of Iowa, $20; A. K., of Prussia, $20; J. J. G., of Ohio, $20; D. G., of Pa., $48; S. G., of N. Y., $20; H. T. L., of N. J., $16; S. B. T., of Wis., $16; G. G. P., of Pa., $16; D. L., of Ohio, $50; J. B., of R. I. $16; E. H., of Ind., $25; W. T. H., of Maine, $12; J. N. B. J., of Mass., $16; G. S., of Vt., $25; C. E. T., of U. S. A., $25; M. C., of Maine, $16; S. J. M., of Mo., $25; R. L. S., of N. Y., $16; G. H. H., of Pa., $16; H. D., of Pa., $40; C. H. D., of N. Y., $16; W. G. K., of Ind., $25; E. C., of Conn., $15; J. A. McC., of Ky., $12; H. C., of Conn., $12; J. N. J., of Mass., $20; J. H. C., of W. Va., $20; W. W., of Cal., $20; G. C. B., of Ill., $16; E. E. C., of N. Y., $22; W. A. B., of Vt., $20; G. C., of N. Y., $20; W. H. A., of N. Y., $20; J. W., of Ind., $25; W. R. M., of Pa., $50; J. G. L., of Ohio, $25; C. P. H., of Wis., $16; J. N. McL., of Pa., $25; D. K., of Ind., $16; H. P. C., of Oregon, $10; J. A. L., of Wis., $25; J. H. S., of N. Y., $15; J. A. C., of Iowa, $20; T. N. D., of Ind., $21; P. & K., of N. J., $25; B. F. C., of Colorado Territory, $10; J. G. B., of N. Y., $22; E. C. C., of Mass., $60; J. W., of Ohio, $20; R. D., of Ohio, $21; J. W. K., of N. Y., $22; C. M., of N. Y., $20; H. V. B., of N. Y., $20; C. & F., of N. Y., $45; J. F. B., of N. Y., $20; G. L. T., of N. Y., $16; J. L. H., of N. Y., $10; W. H. H., of N. Y., $16; J. B., of Ind., $20; T. & W., of Pa., $16; B. A. W., of Wis., $16; S. F. K., of Mich., $45; M. F., of Conn., $25; J. O., of Ky., $31; J. H. W., of Ohio, $15; A. R., of N. Y., $250; C. B. R., of Mass., $50; J. A. M., of Conn., $15; A. F. W. P., of N. Y., $45; J. W., N., of Conn., $41; C. A. M., of Ohio, $25; H. K. A., of N. H., $20; C. & S., of Mass., $15; P. H. R., of Ind., $28; B. & H., of Ind., $15; J. B. of N. Y., $25.

Persons having remitted money to this office will please to examine the above list to see that their initials appear in it and if they have not received an acknowledgment by mail, and their initials are not to be found in this list, they will please notify us immediately, stating the amount and how it was sent, whether by mail or express.

Specifications and drawings and models belonging to parties with the following initials have been forwarded to the Patent Office, from Wednesday, July 20, 1864, to Wednesday, July 27, 1864:—

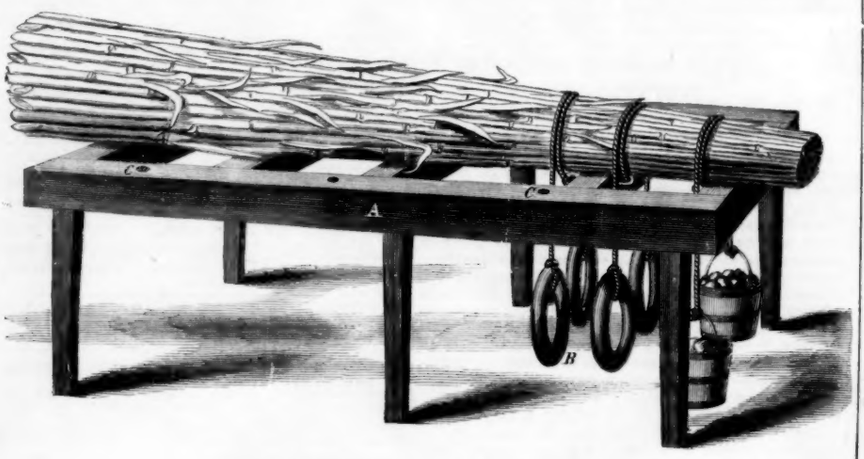
J. W. K., of N. Y.; E. E. C., of N. Y.; J. B., of N. Y.; H. C. H., of Ill.; J. N. McL., of Pa.; E. H., of Ind.; C. B. R., of Mass. (2 cases); J. G. L., of Ohio; G. S., of Vt.; J. O., of Ill.; W. & S., of Germany; S. F. K., of Mich.; H. D., of Pa.; P. & K., of N. J.; W. G. K., of Ind.; E. C. C., of Mass.; A. F. W. P., of N. Y.; P. H. R., of Ind.; A. S., of N. Y.; L. D. L., of N. Y.; M. F., of Conn.; W. T. H., of Maine; G. McK., of N. Y.; J. A. L., of Wis.; D. L., of Ohio; (2 cases); J. W., of Ind.; S. J. M., of Mo.; C. E. T., of U. S. A.; W. R. M., of Pa.; C. R. H., of Wis.; C. A. M., of Ohio; L. G., of Cal.; J. W. N., of Conn.; J. A. McC., of Ky.; W. S. R., of Cal.; A. R., of Cal.

RATES OF ADVERTISING.

TWENTY-FIVE CENTS per line for each and every insertion, payable in advance. To enable all to understand how to calculate the amount they must send when they wish advertisements published we will express in that ten words average one line. Engravings will not be admitted into our advertising columns, and, as heretofore, the publishers reserve to themselves the right to reject any advertisement they may deem objectionable.

Improved Method of Stripping Cane.

The process of preparing sorghum cane for crushing is a slow, tedious, and costly one, when done by hand, for each blade has to be pulled off the cane separately. The apparatus herewith represented very much facilitates this work, for it is only necessary to lay the canes, as shown, on the long platform, A, and bind them with ropes. One rope will do, but two are more convenient. The weights, B, are then attached to the ropes, so that the bundle is bound firmly together. The operator then takes hold of a



TODD'S METHOD OF STRIPPING CANE.

cane and pulls it out of the bundle, this causes the leaves to catch one another and be torn off, leaving the naked stalk in the hand. The rapidity and perfection with which this is done will be apparent to every one. We consider it a great improvement, and think it will be appreciated by sorghum cultivators.

The seeds and leaves are all left in one place by this arrangement, so that they are not wasted, but can be gathered up and fed to cattle. This arrangement is easily made by any farmer, and will prove a great advantage. The holes, C, are for standards to support a greater quantity of canes if needed.

This stripper was patented by Wm. Todd, of Barnesville, Ohio, on April 5th, 1864, through the Scientific American Patent Agency. For further information address him, or R. M. Gunning, General Agent, Barnesville, Belmont county, Ohio.

Improved Railroad Chair.

The cost of keeping the track in good running order, during a year, forms one of the largest items in all railway companies' annual reports. From the want of a good chair the joint ties get down, making not only a rough track, but causing serious damage to the rails by battering and very often breaking them. All railroad men desire some means of securing the rails, at their meeting points, better than the common cast or wrought-iron chair, to lighten both expense and labor, in keeping the track in surface and in line. The annexed engravings illustrate a novel, and yet substantial, mode of securing the rails in their place and keeping them there, when laid as the plan contemplates.

Fig. 1

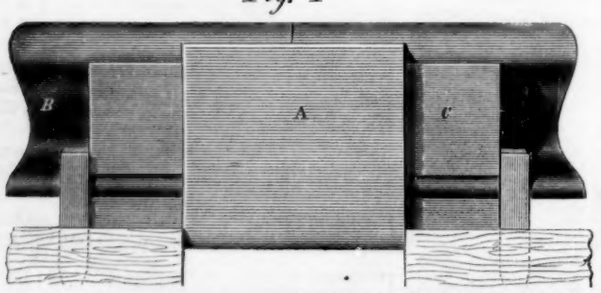
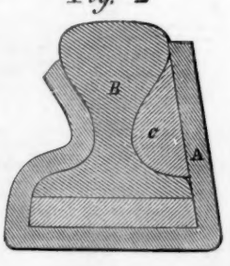


Fig. 2



ST. JOHN'S RAILROAD CHAIR.

This rail chair is composed of three pieces—bed-plate, A, clamp or chair proper, B, and sustaining bar, C—all of wrought or rolled iron. The bed-plate is as wide as the base of the rail, of any thickness and length desired, which is let into two cross-ties, laid six inches apart, and resting in the clamp or chair proper, which is so formed as to have the inner lip turned up into the neck, and under the head of the rail, while the outer lip is bent at an acute angle, until it rests against the rail's head, but not so high as the rail itself, thus leaving a half oval space between it and the web or neck of the rail, into which the sustaining bar is forced. This bar is to be as long as the bed-plate, and a little larger than the opening, the rails having been inserted into the chair, which completes the joint, thus affording a triple support on two cross-ties instead of one cross-tie, which is now the universal condition. To prevent the sustaining bar from working either way (though of that there can be no possibility), as well as to secure the track from spreading, the rails should be slotted for spikes $8\frac{5}{6}$-inches from the ends, which will bring the spikes at each end of both bed-plate and sustaining bar. Such is its construction and application, and from the tests so far applied it is confidently offered to railroad companies by the patentee as the best rail chair known.

It was patented on May 19th, 1863, and also on May 28th, 1864, by E. St. John, of Elmira, N. Y., through the Scientific American Patent Agency; for further information address the inventor as above.

PHOTOGRAPHIC ITEMS.

Disderi, a photographer, of Paris, takes *cartes de visite* upon what is termed "porcelain paper." They are simply positives said to be done in the same manner as pictures upon porcelain glass, and are pronounced exquisite.

The camera is rendering great assistance now-a-days to portrait painters. They photograph the subject, life-size, upon the cameras, and then paint. Crayon drawing is also receiving photographic aid. A *carte de visite* negative is enlarged and printed upon tinted paper, which serves the artist as a sketch. With three crayons, red, white, and black, the sketch may be converted into a beautiful crayon picture.

THE SCIENTIFIC AMERICAN.—This invaluable journal enters upon its eleventh volume of the new series with the most flattering and well-deserved prospects of success. We know of no paper which can be perused with more profit or satisfaction by the general reader than this. Every line, paragraph, and sentence teems with instruction, and that of a character well calculated to benefit. We hope that its prosperity may increase, until every family in the land is benefited by its weekly presence.—*Culturist, Philadelphia.*

SURFACE CONDENSERS.—Dr. Thornton invented a surface condenser in 1787. He called it a "pipe condenser" as distinguished from the jet variety which was termed a tube condenser. It is stated that of the two varieties, the pipe condenser *without injection* was the best. It was tried on John Fitch's experimental steamboat on the Delaware river. The jet-condenser and its relation to the air-pump is the same to-day in principle as when John Fitch first invented it.

THE RULING PASSION.—The fondness of women for finery and personal adornment is well illustrated in the following paragraph, cut from an account of a visit to a jail. The writer says of one woman, a murderess:—"She had her cheeks highly colored with something which looked like *rouge*. The keepers don't know where she gets it, or what it is—whether the juice of flowers, or some other coloring material. In the silence and solitude of a prison cell with none to see or admire her, this female still bedizened herself with the best material at hand."

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